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Portland Cement.

ONE characteristic of the past twelve months has undoubtedly been the large number of technical books produced by British publishers or placed on the market by the agents of American firms. This flood of literature has brought with it quite an epidemic of treatises dealing in one way or another with Portland cement. The application of this valuable material to concrete-steel construction has attracted so much notice within the last year or two, and has been so little represented in permanent literature, that technical writers have rushed headlong into print, impelled doubtless by the forces somewhat vaguely expressed by the saying, "Nature abhors a vacuum." But we have had also at least three or four good books devoted to cement and concrete in which these materials are considered without special reference to their combination with steel, and the best of these, in one sense, is the new edition of a treatise on the manufacture, testing, and use of Portland cement, by Mr. D. B. Butler,* whose name is familiar to all cement users.

As in the previous issue, the author has confined his attention to the topics mentioned above, and for this reason has been able to give practical descriptions of manufacturing and testing processes, without feeling impelled to curtail useful matter by an ever-present fear that the limits of space will not permit him to say quite so much as ought to be said for the purpose of really adequate exposition. Mr. Butler has done wisely in not trying to squeeze into a single volume too many branches of the subjects coming under the general head of cement and concrete. Consequently he has been able to do justice to those selected for consideration. It is in this sense that we may regard his work as the best of its kind that has appeared within the last few months. The book possesses a further recommendation owing to the fact that it is written by an English expert for English readers—a merit that does not seem to be quite so obvious to some publishers in this country as it probably will become before long.

When the first edition was issued some six years ago the general method of cement manufacture was radically different from that prevailing in the present day. There was then not a single installation of the rotary continuous kiln in the country, and as this must be regarded as the kiln of the present and the future, the need for revision of the previous text was particularly obvious. Further, sundry types of grinding machinery have become somewhat obsolete, and here again fresh descriptive matter was required, a necessity applying also to methods of testing, especially in view of the Report on Portland cement issued by the Engineering Standards Committee.

Portland cement can be produced from any raw materials containing constituents capable of yielding, by calcination, the silicates and aluminates of lime which form the chief components of that material. Those two familiar substances, chalk and mud, furnish all that is required, and are abundantly found in the lower reaches of the Thames and the Medway, which form the chief seat of the cement industry. The soft marls of Cambridgeshire are capable also of yielding excellent cement, which recent tests by Mr. Butler show to be "equal, if not superior, to the Thames and Medway brands." All such raw materials, being readily reduced to slurry in the wash-mill, are treated by the "wet process" of manufacture. Others, being less easily reduced, require the aid of grinding machinery to enable the maker to secure an intimately blended mixture. These materials require treatment by the "dry process," and are represented by the blue lias formations of Warwickshire and other counties.

We need not refer to details of the wet process or of the modification known as the "semi-wet or Goreham process," both of which are fully described by the author, who also points out and illustrates by photographic views some bad effects resulting from incomplete mixing and faulty washing during this stage of manufacture. When the semi-wet process is adopted the final reduction has to be effected by grinding machinery, and only sufficient water is used in the wash-mill to permit the mixture to be pumped direct to the kiln-drying chamber.

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* "Portland Cement: Its Manufacture, Testing, and Use." By D. B. Butler, A.M.Inst.C.E., F.C.S. London: E. & F. N. Spon.

Although effecting considerable saving in labour, this process does not afford the opportunities for correcting the proportions of the raw materials which are characteristic of the wet process. Having experience of both systems, Mr. Butler confesses to "a sneaking fondness for the older method so far as regularity and reliability are concerned," inclining to the opinion that it is particularly advantageous where very variable raw materials have to be dealt with, and where a few pence per ton in the cost of production are not of such paramount importance as the regular and consistent quality of the product. We think, however, that the one objection to the semi-wet process could be eliminated by the employment of auxiliary mixing mills in conjunction with frequent tests and corrections of the slurry before it is pumped to the kilns.

Having discussed in full detail the various methods of drying and calcining the raw material and the means available for grinding the resulting clinker, Mr. Butler gives a short account of the "dry process." This method is necessary where the raw materials are too hard for treatment by water in the wash-mill and have to be ground and mixed in the dry state. Although chiefly employed for limestone and shale, the dry process has also been applied to the soft chalk marls of Cambridgeshire. Calcination of the mixture and subsequent grinding of the clinker are essentially the same as in the wet process, although it is the fact that some special types of grinding mills are not so suitable for reducing the hard clinker produced from the lias formations as for the softer clinker yielded by the materials occurring in the London district.

Very little that is new can be said with regard to the testing of Portland cement. One or two fallacious tests still linger, and the manner in which approved tests are applied by different operators frequently gives rise to contradictory results. Consequently it may be said that the chief need of the present day is for a standard code of tests to be conducted under such conditions as will remove, as far as possible, differences due to the personal equation. Another consummation much to be desired is the formulation of a universal standard for adoption by the chief countries of the world. The realisation of such an ideal will probably be deferred for some considerable time, in spite of the laudable efforts made by the International Association for Testing Materials of Construction, a branch of which exists in this country but is practically unknown, and has done no work so far as we are aware.

Of course, the objects to be attained by testing are not always the same. The scientific chemist conducts investigations that are intended to increase general knowledge as to cementitious substances, the architect or engineer makes tests to ascertain the characteristics likely to be developed by some particular example in practical use, and the manufacturer to satisfy himself that the material complies with the requirements of specifications. But it very often happens that these three classes have to make tests all directed to the same end—that is, to determine the suitability of a given cement to a given duty. To enable determinations of the kind to be made with substantial accuracy the six simple tests described by Mr. Butler are amply sufficient to enable the operator to form an approximately correct opinion as to the essential properties of a given quality of cement. The tests in question are for soundness, fineness, strength, setting, weight, and chemical composition. If, as the author is careful to point out, too much reliance be placed upon any one test taken by itself, erroneous conclusions may be drawn. For instance, assuming that a sample indicates satisfactory tensile strengths at the end of seven days, it does not follow that the material is sound or that its strength will continue to increase with age. The development of high tensile strength when the specimen is new may indicate excess of lime; and, on the other hand, low tensile strength may suggest a moderate proportion of lime. But both these suggestions may be wrong, and it is only by comparing the results of various tests that a true interpretation can be made.

We should have thought that every intelligent cement user in the present day knew the inconclusive character of tensile tests considered alone; but, judging from some remarks in Mr. Butler's book, a very prevalent opinion seems to be that if a sample of cement when gauged neat develops a good tensile strain at seven days there is nothing more to be desired. Soundness is a far more important quality, for whatever initial strength a cement may possess it cannot be of any value as a material of construction if liable to expand and disintegrate after incorporation in a building or other structure.

As the engineer-chemist upon whom has fallen the mantle of the late Henry Faija, Mr. Butler very naturally believes that the most reliable method of examining cement for soundness is the warm water test introduced by that eminent expert. We know the "Faija" test to be perfectly reliable if employed with ordinary care, and one great advantage it offers is that, in places where testing machines and plant are not available, if used in conjunction with examination of the cement for fineness of grinding, the results may be taken as approximately correct indications of the constructional value of the material.

Mr. Butler briefly describes the "Le Chatelier" test for soundness without adding any remarks of a commendatory character, and in a later chapter he says that this "is unnecessarily severe, and frequently condemns a good sound cement." Of course, everyone is entitled to his own opinion, but as the Standard Specification of the Engineering Standards Committee, reprinted in Appendix III., states, under the head of "Soundness," "the cement shall be tested by the Le Chatelier method and shall in no case show a greater expansion than 12 millimetres after twenty-four hours' aeration and 6 millimetres after seven days' aeration," it is to be regretted that Mr. Butler takes the position of a dissentient. This specification was approved by twenty-three engineers and others representing Government departments, important public bodies, scientific institutions, associations of cement manufacturers, and including among their number several eminent civil engineers and members of large firms of engineering contractors. Further, a large amount of information collected from engineers, manufacturers, and cement users was carefully collected and considered before the specification received final approval.

The Le Chatelier test is quantitative, enabling the operator, by means of two indicators attached to a split cylinder of brass in which the cement is moulded, to take exact measurements of expansion after the lapse of defined periods, and thus to judge the soundness of the sample under examination. In the Faija test, which is purely qualitative, the results are given in the form of what may be termed safety and danger signals. Mr. Butler thus describes how its indications are to be interpreted:

"If a pat treated therein at the prescribed temperatures shows no signs of cracking or blowing at the end of the twenty-four hours, and adheres firmly to the glass plate on which it was made, the cement may be used with perfect confidence; it will never 'blow.' If, on the other hand, the pat shows slight cracks, or blisters badly on the under surface next the glass, it is a danger signal, so to speak, which should not be disregarded. But before condemning the cement off-hand it is as well to ascertain if these signs of unsoundness are due to the really bad quality of the sample or merely to its being too fresh or hot, consequent on having been recently ground. For this purpose it is necessary to spread the sample out in a thin layer for a day or two in a cool dry place, and then try it again. If on the second trial the obnoxious characteristics hitherto developed have disappeared it may be safely assumed that the cement was merely too fresh, and will be safe to use after judicious aeration and maturing."

This quotation sufficiently shows that the Faija test, reliable as we admit it to be in careful hands, lacks the simplicity and precision of the Le Chatelier method.

Since the late Mr. John Grant first drew attention to the great importance of fine grinding, progressive improvement has been made in this direction, but we are sorry to say that British manufacturers have been far less ready to learn the lesson than their foreign rivals. In self-defence, however, they have now taken up improved methods of grinding. Mr. Butler quotes some interesting records from the testing books of his laboratory, suggesting the improvement that has taken place during the last quarter of a century. Thus, taking ten samples in each of the years 1880, 1890, 1895, and 1900, the percentage of residue on a 50 by 50 sieve averaged about 24·2, 4·7, 1·6, and 0·16 per cent. respectively. In 1900 and 1905 the averages on a 76 by 76 sieve were 2·3 per cent. and 1·2 per cent., and in 1905 the residue for ten samples on a 180 by 180 sieve ranged from 11 per cent. to 26 per cent., the average being about 18·75 per cent.

From some remarks on the thickness of wire of which the gauze for cement sieves is composed we conclude that the revision of the author's book must have been made before the end of 1904. Otherwise he would scarcely say: "Unfortunately, in England we have no agreement upon this matter; each engineer, when he specifies it at all, specifies the thickness of wire which meets his fancy, and the result from a manufacturer's point of view is often very annoying." This lack of a standard gauge for adoption was filled by the British Standard Specification for Portland Cement, issued in December, 1904,

or ten months before the date of the preface to the second edition of Mr. Butler's work. The requirement now is that the residue shall not exceed 3 per cent. on a 76 by 76 standard sieve, or 22·5 per cent. on a 180 by 180 standard sieve. It is interesting to note that the thicknesses of wire recommended by the Engineering Standards Committee for these two sieves are virtually the same as those adopted by the author, "in order to bring his results into line with Continental and American practice."

We come now to the very familiar test for tensile strength, and while this seems most simple it is one that clearly requires skill and judgment. The proper quantity of water to be used in making briquettes cannot be exactly defined, and to quote from the British Standard Specification, "shall be appropriate to the quality of the cement, and shall be so proportioned that when the cement is gauged it shall form a smooth, easily-worked paste that will leave the trowel cleanly in a compact mass." Here we have an undoubted loophole for variable results. Mr. Butler rightly says that "the shape of the briquette has more effect on the result obtained than is generally recognised." He illustrates different forms of briquette, but in the body of his work that of the Engineering Standards Committee is not noticed, an omission which is made good in a somewhat inconspicuous manner by Appendix III., containing the British Standard Specification. On all important details connected with tensile tests Mr. Butler is in line with the demands of this specification.

Further agreement is to be found with regard to determination of the condition known as "set" by the "Vicat needle," this appliance having generally displaced the thumb-nail as an instrument of precision in tests designed to throw light upon the setting properties of cement. We have referred on a previous occasion* to Mr. Butler's demonstration of the delusive character of the "marmalade pot" temperature test, which, while enabling the operator to insure the use of extremely slow-setting cement, gives no security against unsoundness, as some engineers have supposed. The subject receives somewhat lengthy consideration in the chapter on "Setting Properties," which we hope may have the effect of removing any lingering predilection in favour of the so-called temperature test. Apart from its useless and vexatious character the continued employment of this test would certainly tend to encourage the addition of adulterative materials with the object of avoiding the very small increase of temperature during setting.

The remaining tests for Portland cement are those for specific gravity and chemical composition, the former being one that can be performed with accuracy by any of the types of appliances described and illustrated by Mr. Butler, providing all the air entangled by the particles can be removed—a task that is not altogether easy. The specific weight of cement has generally been considered to afford a direct clue to the degree of calcination effected in the kiln, for an under-burned clinker is light as compared with one thoroughly calcined. We note, however, that the results so far obtained from a series of experiments now being conducted by Mr. Butler appear to throw doubt on the value of the specific gravity as a criterion of calcination. Great as the value of chemical analysis may be for determining the proportions of the useful and deleterious constitutents of cement, the process is one that can scarcely be conducted by the ordinary practitioner. Moreover, taken alone it is not of much use, for the reason that it cannot reveal defects caused by the faulty treatment of materials mixed in the correct chemical proportions. At the same time it is very desirable that the professional user should be familiar with the chemistry of Portland cement, and the same remark applies to a knowledge of the foreign substances introduced as adulterants by some cement manufacturers. Both of these subjects are discussed in a helpful manner by Mr. Butler, to whose book we refer readers for full particulars. The only adulterants intentionally employed by English firms are Kentish rag and blast furnace slag. Neither of these substances has the effect of improving the quality of cement, as a few makers wrongly believe. Their presence is not indicated by tensile tests of neat cement, a circumstance which is not surprising in view of the well-known fact that as much as 30 per cent. of sand may be added to cement without causing apparent reduction of strength in the testing machine.

With the object of ascertaining the actual effect of admixture of Kentish rag and slag Mr. Butler instituted a series of experiments a few years ago, the results of which are to be found in the *Transactions* of the Society of Engineers, and are summarised in his present work. From this investigation it became clear that the 3 to 1 sand test "showed a marked diminution in strength when the sample contained an appreciable quantity of such inert material," although, as Mr. Butler says, "this by itself is not sufficient to enable a decided verdict to be given as to whether a cement is pure Portland cement or not." The presence of Kentish rag can be detected by a simple chemical test, but some blast furnace slags cannot be identified in the same way, owing to the similarity of their chemical composition with that of cement. Hence the miscroscope is a valuable aid in determining the presence of foreign substances in cement, and the reader will find in Mr. Butler's book several very interesting photographic diagrams showing the appearance of Kentish rag, pure cement, cement admixed with ragstone, and cement admixed with slag.

Cement specifications as drawn by some engineers in the past have exhibited various amusing contradictions and impossible demands, but it may be hoped that the revised edition of the British Standard Specification, now in course of preparation, will prevent the recurrence of such inconsistencies as those upon which Mr. Butler comments. His treatise is an eminently satisfactory discussion with a distinctive value of its own, and should be useful alike to those possessing limited knowledge, and to others who are well-informed on the subject of Portland cement.

* *The Builder*, Vol. LXXXIV., p. 582.

ARCHITECTURAL CONCEPTIONS AT KNOSSOS AND PHÆSTOS.

By THEODORE FYFE.

THE current "Annual" of the British School at Athens contains an article (to be continued) by Dr. Duncan Mackenzie on "Cretan Palaces and the Aegean Civilisation," which is a most important contribution to the study of (so-called) Mycenæan architecture.

It indeed deserves particular notice as a necessary rejoinder to two recently-expressed foreign opinions on the Cretan remains—by Dr. Dörpfeld, in the periodical *Athenische Mitteilungen* (XXX., pp. 257-297), and by Professor Noack in his pamphlet "Homerische Paläste."

Dr. Mackenzie criticises these opinions in detail, and, as it may safely be said that in the main his views are also those of Dr. Arthur Evans, the article in the "Annual" may be said to represent the English standpoint. That standpoint will no doubt be given more fully to the world when we get Dr. Evans's book; but meanwhile it may be useful to point out the importance of the questions at issue to the student of Early Aegean architecture.

These questions may best be stated by a summary of Dr. Dörpfeld's and Dr. Mackenzie's views as expressed in their respective articles.

The German archæologist, his mind full of the stratification at Troy and the typical "Achæan" plan at Tiryns, sees in the west wing at Knossos,* with its pillar rooms and long row of magazines, the remains of an early palace of "Carian" (or, in other words, original Cretan) type, on which were built at a later date, *and quite independently*, a palace of mainland or "Achæan" type, replete with the large pillared halls which were its chief characteristic; at Phæstos, where he gets the *raison d'être* of his argument, he sees a great stepway leading up to an actual pillared hall or megaron of the "Achæan" type, existing as a late feature amidst architecture which is mostly earlier and has no real connexion with it.

In answer to this Dr. Mackenzie begins by stating the one common ground of agreement, the existence of an earlier and later palace, both at Knossos and Phæstos; but he maintains that Dörpfeld has failed to perceive the essential difference between the two sites; that, whereas at Phæstos the early or "Middle Minoan" palace was for the most part covered up and ignored when the later palace was constructed, at Knossos, in the west wing at least, the early remains were incorporated with the later, in places so subtly blended with them that it is extremely difficult to tell one from the other; so that in this west wing at Knossos we see in effect the ground story of a homogeneous Cretan palace which had an upper story (or storeys) supported directly on the walls and piers below, a palace which is late Cretan in its developed form, but still Cretan, and neither "Achæan" nor anything else. Mackenzie maintains, moreover, that

* As Dr. Mackenzie points out, Dr. Dörpfeld evidently considers the west wing at Knossos as the only part of that palace deserving of his attention, ignoring the much more complete evidence of the "domestic quarter" in the east wing.

Dörpfeld has misread the early and late elements in the Phæstos plan, and that a complete "systematic connexion" exists between the so-called megaron and the other leading features of that palace. Nor is this all. He challenges the very existence of the megaron on which Dr. Dörpfeld principally bases his theory, maintaining (and here he is completely on his own ground) that it was a light-well and no megaron at all, from the evidence of similar light-wells in the eastern wing at Knossos.

So far then the question is mainly one of stratification. A further point raised concerns the spacing of columns in these Cretan plans. Dr. Mackenzie agrees that a central column in an opening or system of supports is a very general Cretan feature, and so far endorses the views of Professor Noack. But he takes the (surely sound) view that the use of the central column was a matter of expediency in the first instance, and that as a feature it was in reality no more typically Cretan than the two-column system. He shows that the central column was occasionally met with in the later planning, at a time when Minoan building had reached its zenith, and showed large grasp and ordered architectonic arrangement. That the feature is early he admits is undisputable, but he exposes as a fallacy the view that it was practically universal in typical Cretan work, and that any departure from its use is un-Cretan.

So much for the main outlines of this interesting discussion. It is a bare outline: there is much in the working out that cannot be touched on here, particularly with regard to the question of light-wells. It will be seen, however, that Dr. Mackenzie's argument is a constructive one. It is somewhat lengthy, and cannot easily be followed point by point by one unacquainted with the sites in question; but besides containing the best exposition of the Phæstos plan that has yet appeared in English, at any rate, it goes far towards giving us a clear understanding of the essential characteristics of Cretan architecture. That architecture was something quite apart from the Pelasgic work of the mainland, as seen at Tiryns and Mycenæ, and is not to be confused with it nor associated with it. In its finest form it had pillared halls and loggias, winding staircases and great stepways; and, above all, a system of stone-faced light-wells, paved with cement which was turned up on the walls, and drained by channels leading to underground conduits. These light-wells were also pierced with doors and windows, and thus became the nuclei of various systems on a plan.

There can be no doubt at all that the Cretan style of building had a direct influence on the mainland work; but there is very little doubt that there was no grand planning on typical mainland lines above the walls of Knossos and Phæstos till after these palaces, as we know them now, had ceased to be inhabited.

A careful comparison of the plan of Tiryns on the one hand, and the plans of Knossos and Phæstos on the other, is useful, but an important question must still remain to some extent unanswered—the exact relationship in building tradition between the island and the mainland work. Dr. Mackenzie's article, however, may be taken as a safe commentary on the former and certain phases of the latter.

The article is illustrated by a nearly complete representation of the very fine plan of Phæstos, though it is to be regretted that the figuring on the plan, as reproduced (largely referred to in the text) is so small as to be almost unreadable.

There is also a plan of the "domestic quarter" at Knossos, a plan of the palace at Phylakopi, in Melos, and various photographs.

NOTES.

British Forestry. SINCE the recommendation of the Departmental Committee on British Forestry of 1902, that the Alice Holt Woods in Hampshire should be utilised as a demonstration area, the Commissioners of Woods and Forests have—by no means too soon—requested Professor Schlich to prepare a working scheme for experimental forestry in these Crown woodlands, where nearly 2,000 acres are now under wood. The programme in question has recently been published by the Royal Scottish Arboricultural Society, and shows the manner in which the annual yield of timber may be improved with the prospect of really adequate results in the course of the next sixty years. In this particular case the labour question is a difficult one, but there is no doubt that with the establishment of systematic working permanent occupation would be found for numbers of men trained to outdoor work but unable to find regular employment, largely owing to the general application of labour-saving machinery to agriculture. We are glad to learn also that Professor Schlich has been able to arrange facilities, with the co-operation of several colleges in Oxford, for practical forestry instruction in the vicinity of that city.

The Canadian Pacific Railway. FIRST suggested in 1847 by Major Carmichael Smith, the Canadian Pacific Railway, as we now know it, was not opened to general traffic for nearly forty years later. In 1866, the American Pacific Railroad, growing at the rate of 3 miles a day, was rapidly nearing completion while the British line remained a dream. In 1874, however, a start was made upon railway construction between Lake Superior and British Columbia; in 1878 Mr. Donald Smith (now Lord Strathcona), Mr. George Stephen (now Lord Mount-Stephen), and Mr. James Hill, bought out the Dutch bondholders of the St. Paul and Pacific Railway, thus obtaining control of the line and laying the foundations of the Canadian Pacific and Great Northern railways. In 1880 822 miles of track had been laid, and by vigorous efforts the Inter-Oceanic line was completed in 1886. The history of this great undertaking is briefly set forth for the information of those interested, in a recently-published pamphlet by Mr. D. O. Croal, F.S.S. The effect of the railway has been of the greatest possible value in forwarding the development of the north-west provinces of the Dominion, and it is not surprising that two kindred projects are in course of realisation at the present time. The fact is that Canada generally, and the north-west provinces in particular, furnish traffic and profits more rapidly than the Canadian Pacific can deal with and gather. The further development of that great country depends very much upon the extension of the railway system in such a way as to bring the more remote regions into closer touch with Great Britain and the world at large.

Engineering Standards Committee. REPORT No. 24, issued this week by the Engineering Standards Committee, is a somewhat bulky document dealing with sundry materials used in the construction of railway rolling-stock. No branch of British engineering industry has suffered more from the conflicting demands of consulting engineers than that of locomotive building. Apart from the question of general design, which has already been considered by the Committee, the selection of materials is a point upon which very divergent opinions are entertained. Consequently, the present standard specifications have only been settled subject to the proviso that they shall be reconsidered from time to time as occasion may require. Further, to meet the views of Home, Indian, and Colonial authorities, it has been found necessary in many instances to include what are practically duplicate specifications, one with and the other without a chemical analysis, in order that those who do not desire to specify a chemical analysis shall still be able to employ a standard specification. The Report comprises eighteen specifications, exclusive of those duplicated, and for the convenience of users the previously published Report, specifying forms of British Standard tensile test pieces, is printed as an appendix.

Standardisation of Steel Conduits. WE have received from the Engineering Standards Committee the "British Standard Specification for Steel Conduits for Electrical Wiring." It is most essential that the conduits supplied by the various manufacturers should be standardised, and so we expect that this Report will meet with general approval. We notice that no dimensions are given for ½-in. or ⅞-in. tube; we presume, therefore, that tubes of these sizes will not now be made. Six sizes are given, ranging from ⅝ to 2 in., and this ought to be sufficient for all ordinary requirements. The length and thickness of couplers and the length of the thread on the ends of conduits are fixed by means of simple empirical formulæ, and this ought to prove satisfactory in practice. Conduits and their accessories are to be gauged at the works of the manufacturer, partly before and partly after enamelling or galvanising, and thus disputes can rarely arise. In one or two places we think that the Report might have been worded more carefully. For instance, we are told that the "radius of any bend" measured "from the centre of curvature to the axis of the bend" must not be less than certain given numbers. Now we are not told whether it is the inside, the outside, or the mean radius of curvature of the bent cylindrical pipe that is to be

taken. As this radius is only about twice the diameter of the pipe it makes a great difference which line we take, especially when a sharp bend has to be considered. The recommendations as to the gauging of the conduits are clear. Limit-gauges are to be used for determining the outside and inside diameter, but the average thickness of the steel conduits is to be determined by weighing at least 100 ft. of the conduit. The Report concludes by defining the various kinds of gauges. There are first the shop gauges, next the reference gauges, and finally the standard gauges, which are deposited in the National Physical Laboratory for purposes of reference. It is recommended that the reference gauges be verified and their accuracy certified by the National Physical Laboratory.

Concrete-steel Reservoir, Nuneaton. A COVERED service reservoir, now in course of construction for the Nuneaton and Norton Chilmers Urban District Council, demonstrates the striking advantage with which reinforced concrete may be employed under difficult conditions. In consequence of old pit-workings in the vicinity of Nuneaton the ground is apt to subside unexpectedly, as well as to develop sliding movements. Owing to disturbances of this character, the brick and concrete covered reservoir formerly in service was cracked completely across, and as no site could be selected where absolute immunity from earth movements could be guaranteed, the district council decided, on the recommendation of their engineer, to build the new reservoir in concrete-steel. The new work measures about 100 ft. long by 80 ft. wide by 11 ft. deep, the capacity being 500,000 gallons Being relatively light, the construction imposes far less weight on the ground than brick and plain concrete, and so has a smaller tendency to start earth movements. Moreover, as the whole of the work is monolithic and strongly reinforced, the reservoir may be compared to a shallow, self-contained tank of extreme rigidity, and capable of resisting any tensile or other strains that may be developed by subsidence or shifting of the ground. The confidence of the designer in the strength of the construction is shown by the fact that the reservoir is founded upon a "spoil bank," which, although some forty years old, is not consolidated for more than 18 in. beneath the upper surface.

The Honor Oak Reservoir Accident. AS OUR readers may have noticed in the daily Press, an unfortunate mishap occurred on Tuesday last at the new reservoir works for the Metropolitan Water Board. An aerial cableway for the conveyance of material had been stretched between two steel towers 70 ft. high, and while the erecting engineer was directing a trial trip of the carrier the tower upon which he stood commenced to heel over and fell to the ground. The engineer was picked up dead and several men were injured. From the evidence of the works' manager of the general contractors it appears that the cable was pulled up so taut—to clear the top of the reservoir—that the sag in the span of 700 ft. was only 5 ft. or 6 ft. That an error of judgment was committed by the victim of this fatality is tolerably certain, for it is most probable that the pull of the tightened cable imposed a strain on the anchorage that had not been contemplated by the designer of the structure. The mishap should teach erecting engineers that anxiety to complete their work must be tempered by caution, even at the risk of delay.

The Modern Office Building. A PAPER by Mr. C. G. Darrach, C.E., printed in the last two numbers of the *Journal* of the Franklin Institute, contains a review of the development, design, construction, and mechanical equipment of those large office buildings, which in New York and other great American cities vie in population and importance with many large towns. The subject is a very extensive one, and each branch into which it naturally divides would furnish ample material for more than one paper. Consequently, Mr. Darrach has only been able to touch briefly upon the main features of such buildings, to mention a few historical facts, and to state a few points that may be of service as hints to designers. Although the day of office buildings dawned long ago in Great Britain, it must be confessed that the comfort and convenience of tenants have been very inadequately considered. The paper to which we refer is one that can be read with advantage by British architects, to whom the public have to look for the various improvements in the way of mechanical, sanitary, and domestic equipment that are still so much needed for office buildings in this country.

Sanitary Condition of Haverfordwest. MR. G. C. HANCOCK'S Report to the Local Government Board upon the sanitary circumstances and administration of the borough of Haverfordwest, and upon the recent prevalence of enteric fever there, seems to show that the insanitary conditions arise mainly from defects in water supply. In 1880 the public water supply was derived from two main sources—the Fountain Reservoir in the upper portion of the town, and the Scarrowscant Reservoir, then known as the Portfield Reservoir,* situated about half a mile out of the town. The latter was condemned as a source of water for dietetic purposes in consequence of the unwholesomeness of the water as demonstrated by repeated analyses. Therefore in 1888 it became necessary to increase the then existing supply :—

"This supply did not reach the highest levels in the town, and was, moreover, insufficient in amount. A site for a pumping station was chosen at a place called Crowhill, but was opposed at the public inquiry, and finally a site 1,000 yds. higher up the valley was obtained at Barnsley where a well was sunk. A reservoir to hold 180,000 gallons was constructed at Portfield into which the pump at Barnsley delivered. Water from this source was supplied to the town till the summer of 1900, when it was abandoned in consequence of the water being found impregnated with peroxide of iron, which coated the pipes, fouled the reservoir, and rendered the water unsuitable for domestic use. In May, 1904, the present Crowhill supply was established, though the Town Council had used the Crowhill site as a temporary pumping station since the summer of 1900. This site was the one originally chosen, but abandoned at the inquiry."

* This reservoir is not to be confused with the present Portfield Reservoir, which was constructed in 1888, *i.e.*, since Dr. Parsons's report.

The water is derived by means of pumping from a shallow well situated at Crowhill. The Engineer's house is situated some 100 yds. or less from the well, and the sanitary arrangements of this dwelling are bad in the extreme. Seven people, five of them children, reside in this house, which is undrained. A pail closet receives the household excreta and is said to be emptied once a fortnight, the contents being buried in the garden. Circumstances seem to be even more unpromising at the Fountain Reservoir, which is fed by springs within the reservoir itself :—

"The reservoir is enclosed by a 6 ft. stone wall. Abutting on this wall, on the north, is one of a pair of cottages—indeed, the wall forms part of one side of the cottage. This dwelling consists of three rooms and is occupied by ten persons.

"Excrement from this cottage is accumulated in a pail closet on these premises, which pail closet is periodically emptied, together with part of the house refuse, upon an adjoining garden at a spot only four feet from the reservoir. There was a large deposit in this garden of the mixture of human excrement and house refuse at the time of my inspection."

It is noted also that a large number of the houses are not provided with cisterns, but the inmates store their water in pots, pans, and such like receptacles, and that 638 houses are provided only with hand-flushed closets, "which are mostly in a foul and offensive condition," as is always the case with such an arrangement.

Changes in Grosvenor-square, London. IN October will be offered for sale by auction, at the Mart, the lease of No. 40, which is held from the Duke of Westminster for an unexpired term of thirty-three years from September current at a ground rent of 252*l.* per annum. The property has a frontage of 44 ft., and extends to a total depth of about 210 ft., with extensive stabling in the rear. Having regard to the historical and personal associations which attach to many of the houses in Grosvenor-square, we may mention that No. 40 stands on the south side, and that it was numbered "35" until the re-numbering of the houses eighteen years ago. The present No. 35, formerly "No. 30," on the south side at the corner of South Audley-street, was the home of John Wilkes, whilst the house formerly "No. 40" (and now No. 45), is sometimes, though erroneously, mentioned as being Lord Harrowby's, wherein the Cato-street conspirators intended to murder the King's ministers whilst at dinner, on February 23, 1820. Messrs. Read & Macdonald have been appointed architects for the rebuilding of Nos. 22-3, formerly Nos. 19B and 20, on the west side, at the corner of North Audley and Upper Brook streets.

Getting Church Designs Cheap. A CORRESPONDENT sends us the following delightful advertisement, cut, we are told, from the *Church Times* of August 24 :—

"PICTORIAL POSTCARDS of small, artistic, Gothic churches would greatly help a committee to choose a design for a Highland church to hold about 300. Anyone sending these will receive Highland views in return and will greatly oblige."

We suppress the address to which those who are inclined to sell church designs for photographs of Highland scenery are invited to write. Among the various

means that are employed from time to time for getting architectural designs cheaply this strikes us as the most original that we have come across.

THE TRADE UNION CONGRESS.

THE thirty-ninth annual Trade Union Congress opened at Liverpool on Monday, and will continue its deliberations throughout the week, and we must reserve any detailed comment on the proceedings until next week. The Presidential address was couched in moderate terms, especially when the plastic attitude of the present Government towards the trade unions is taken into consideration. Jubilation on this head was somewhat toned down by the fear of splits arising in the ranks of the Labour Party itself. The old cry once again appeared in the Presidential address that trade unionists would only be satisfied with equality in the law regulating associations of employers and employed, but at the present time it is not easy to determine what such observations betoken. If the present Trades Disputes Bill is to become law, it is clear such equality will no longer exist, but that the law will favour the employees' unions to the detriment of the employers. It can hardly have been the intention of the President to raise this objection, and therefore we can only imagine that his remarks were called forth by doubts as to whether this Bill will ever become law.

The Presidential remarks on the problems arising in connexion with the "starving unemployed" harmonised ill with certain expressions contained in the Report of the Parliamentary Committee. The Report states:—"We must no longer be content to fight for a living wage which is measured by the iron-bound law of supply and demand. We want something even beyond. The demand should be for a higher standard of living; something that will enable us to educate our families, to participite in art, literature, and music and half the good things that help to make life bright, happy, and comfortable." How can a body of so-called business men deliberately pretend to ignore every economic law that has ever been known to the civilised world—to claim employment for men for whose labour there is no demand and in the same breath to demand factitious rates of wages and luxuries and amusements for those employed? The unions are fond of such random statements to excite the interest of their least desirable members, but ignore the plain facts so well known to everyone else, that the standard of wages and living has advanced of late years by leaps and bounds; that the comfort and amusement of the people has been the chief study of the local authorities; and that the working people derive much benefit from the rates levied on all classes. It is hard to make bricks without straw, but it is harder still for trade unionist leaders to make statements founded on hard statistics, and allowance must be made for the militant sensationalism with which these leaders have to draw audiences on such occasions as the annual meetings.

TALL CHIMNEY CONSTRUCTION.

By J. E. STAFFORD, C.E.

As much diversity of opinion exists regarding the form, height, and general details connected with the erection of chimney-stacks, and as so many of these are now being constructed in various parts of the country in connexion with electric-lighting stations, new manufacturing premises, etc., it may prove of some interest to our readers if we submit the following detailed particulars, with drawings, of a tall chimney erected some time ago in connexion with the Isis Portland Cement Works at Clitheroe, Lancashire.

The stack was designed by and erected under the superintendence of the writer, after considerable practical experience in work of a similar nature.

In dealing with the question of the erection of a chimney many details have to be considered, some of which are as follows:—

(*a*) Situation, having regard to convenience of site, with a reasonable length of horizontal flue from boilers, etc., in order to assist the draught.
(*b*) Height, due consideration being given to the adjacent surroundings, *i.e.*, other tall buildings, hills, etc.
(*c*) Suitable ground for foundation.
(*d*) Shape or form, of stack, *i.e.*, square, octagon, or circular.

With regard to the question of situation, it is, in the opinion of the writer, advisable to have a length of horizontal flue beneath the ground level, and between the boilers and the chimney, as this not only very materially assists the draught, and thus saves height in the stack, but it also takes the greatest heat from the boiler flues, which is thus somewhat diminished by the time the chimney is reached.

The height of the stack should also be carefully considered, in order to establish good draught, and the local by-laws fix the minimum according to the h.p. of the boilers under the Smoke-Prevention Act, but it is always advisable to allow a fair margin in the question of height, considering the little extra cost entailed in the first instance.

The matter of the foundation requires much care and attention not only for the stability of the structure but in order to avoid an excess in depth or special precautions, such as piling, extra concrete, or footings, etc., and a suitable place can only be decided upon after the usual methods of sinking trial-holes in order to ascertain the existence of rock or other solid substratum.

With regard to the form or shape of the stack, *i.e.*, square, octagon, or round, much depends on the designer's ideas of stability, coupled with appearances; but in the opinion of the writer the circular design is the best, for several reasons, and amongst these are:—

(1) The minimum amount of building material, *i.e.*, bricks or stone, is required, and thus a saving in the cost and time in erection is effected.
(2) Less resistance to wind pressure.
(3) The circular form insures quicker drying of the structure during erection, and this is a very important matter in chimney building, as we shall deal with more fully later on.

Having briefly dealt with the most salient points connected with the designing and construction of chimneys, we will now give the particulars of the design and erection of the stack before referred to

Fig. 1 of the accompanying drawings shows the half-elevation and half-section of the chimney.

Fig. 2 is an enlarged section in detail of the lower portion of the structure, showing fire-brick chamber, entrance to horizontal flues, mid-feather, flooring, and concrete foundations.

Fig. 3 is a plan of the bottom of the stack.

Fig. 4, enlarged half-elevation and section of top portion of the structure showing cap, principal moulding, neck moulding, etc.

Fig. 5 is the half-plan of the top at the cap and half-plan on mould line, and shows the joints in the terra-cotta moulding, wrought-iron ring, cramps, etc.

The situation of the works where the chimney was required was influenced by the fact that it was part and parcel of an extensive limestone quarry, and consequently the foundation was not far to seek, neither was the height (beyond the local by-laws requirements) to be taken into consideration, there being no tall buildings or high lands immediately adjacent, and therefore the design of the stack became a matter of shape only. This being so, the writer had practically no questions at issue, and at once decided that the chimney should be a circular one, of brick, with terra-cotta mountings.

The stack was required not alone for the large Lancashire boiler, but also for the necessary kilns employed in the manufacture of Portland cement, and it was decided to fix upon a site about 50 yds. away from both boiler and kilns, with the two flues entering the chimney at right angles, as shown in Figs. 2 and 3, and the height was fixed at 150 ft. above ground level.

The excavation for the foundation was in shale and clay, and was readily removed, and the solid rock was found at a depth of about 10 ft. to 11 ft., and the excavated material on being removed was burnt near the site and subsequently used as ballast in the concrete.

The surface of the rock was carefully cleaned and left in its jagged condition without any attempt at securing a flat or even surface, and the major portion of the concrete, which was composed of about four-parts of the before-mentioned burnt ballast to one-part of fresh burnt lime obtained from the adjacent limeworks, was laid in the bottom of the foundation to a thickness of about 4 ft. 6 in. and irregular in form or plan, and this was allowed to stand for several days to set, after which another or top layer of concrete of six-parts limestone (a quantity being ¾-in. chippings) to one-part of Portland cement was laid and the surface carefully floated over to form a bed for the firebrick flooring of the stack, which was composed of bricks 6 in. thick.

The concrete surface was finished 3 in. higher round the circumference of the chimney in order to take the first course of brickwork of the shell, as shown in Fig. 2, this foundation being brought up to a finished surface 6 ft. below ground level.

It was decided that the inside diameter of the chimney should be 6 ft. in the minimum, and a firebrick chamber 9 in. thick and of this diameter throughout was erected to a height of 30 ft. from the chimney floor (see Fig. 2), with a cavity round it commencing at the bottom at 18 in. wide and tapering upwards with the batter of the structure.

This firebrick chamber was constructed in order to take the extreme heat from the flues, and thus protect the outside shell of the chimney, which was in no way attached to the heat chamber, and, in addition, in order to endeavour to further protect the outside shell from the effects of the great heat, ventilating holes were left at intervals round the circumference in the bottom courses of the brickwork.

In this chamber the flue-openings (3 ft. wide by 4 ft. 6 in. to inside top of arch) were formed at right angles, as before stated, and to prevent back draught by the smoke from both flues coming in direct contact with each other on the horizontal, a fire-brick midfeather 10 ft. high and 6 in. thick was erected.

The outside or shell of the chimney was built of radiated red-facing bricks, for which this part of Lancashire is so well known; and the inside with common straight red bricks, and was begun with a thickness of 2 ft. 3 in. (three bricks) at the bottom and continued to a height of 46 ft., with a batter of $\frac{13}{16}$ of an inch to the yard, which was maintained throughout the structure.

At this height of 46 ft. the inside or flue diameter was 8 ft. 8 in., and the brickwork was reduced to a thickness of 1 ft. 10½ in. (two and a half bricks), which was carried up 35 ft., the inside diameter then being 7 ft. 7 in., when it was again reduced to 1 ft. 6 in. (two bricks) and taken up another 30 ft. with the inside diameter of 6 ft. 11 in., being then further reduced to a thickness of 1 ft. 1½ in. (one brick and a half), and this was continued up to the underside of the terra-cotta mould, a height of 35 ft., but a brick neck-mould, consisting of two courses of bricks with an oversailing of 2 in. to each course, then three courses of bricks with one set off of 2 in., and finished with a right angle splayed brick-course of 3 in. thick, was introduced at a height of 135 ft. 6 in. (See Fig. 1 and 4.)

The terra-cotta moulding with an internal diameter of 6 ft., was buff in colour, and in three courses of 1 ft. 3 in., 1 ft. 1 in., and 1 ft. 2 in. respectively, the top course being composed of twelve pieces, the second course ten pieces, and the bottom course eight pieces, and these were all secured to each other by horizontal and vertical dowels of copper, ninety of these being employed.

The total weight of this terra-cotta moulding was about 11 tons.

In the top course of this moulding a hollow space was cast in each piece 4 in. wide by 2 in. deep, and after the moulding was fixed this hollow space formed a complete circular cavity of the dimensions named, into which a solid wrought-iron ring or hoop, 3 in. by 1½ in., and weighing 2¾ cwt., was bedded in cement mortar, making one complete cramp, and thus preventing any chance of the pieces having a tendency to bulge outwards.

Above this moulding was the concluding or top-piece of brickwork, with a length of 9 ft. by 9 in. thick, with an uniform inside diameter of 6 ft., and this brickwork was finished at top by a splayed cap of terra-cotta, 12 in. by 12 in., in eight pieces, cramped together with iron cramps.

A copper tape-ribbon lightning conductor, $\frac{5}{8}$ in. wide by $\frac{5}{16}$ in. thick, with a suitable five-pronged top, was fixed to the stack.

The mortar throughout for the red brickwork was of lime and ground burnt ballast containing a large percentage of limestone, but the terra-cotta moulding and cap were built in Portland cement mortar, whilst the fire-brickwork was bedded in fireclay.

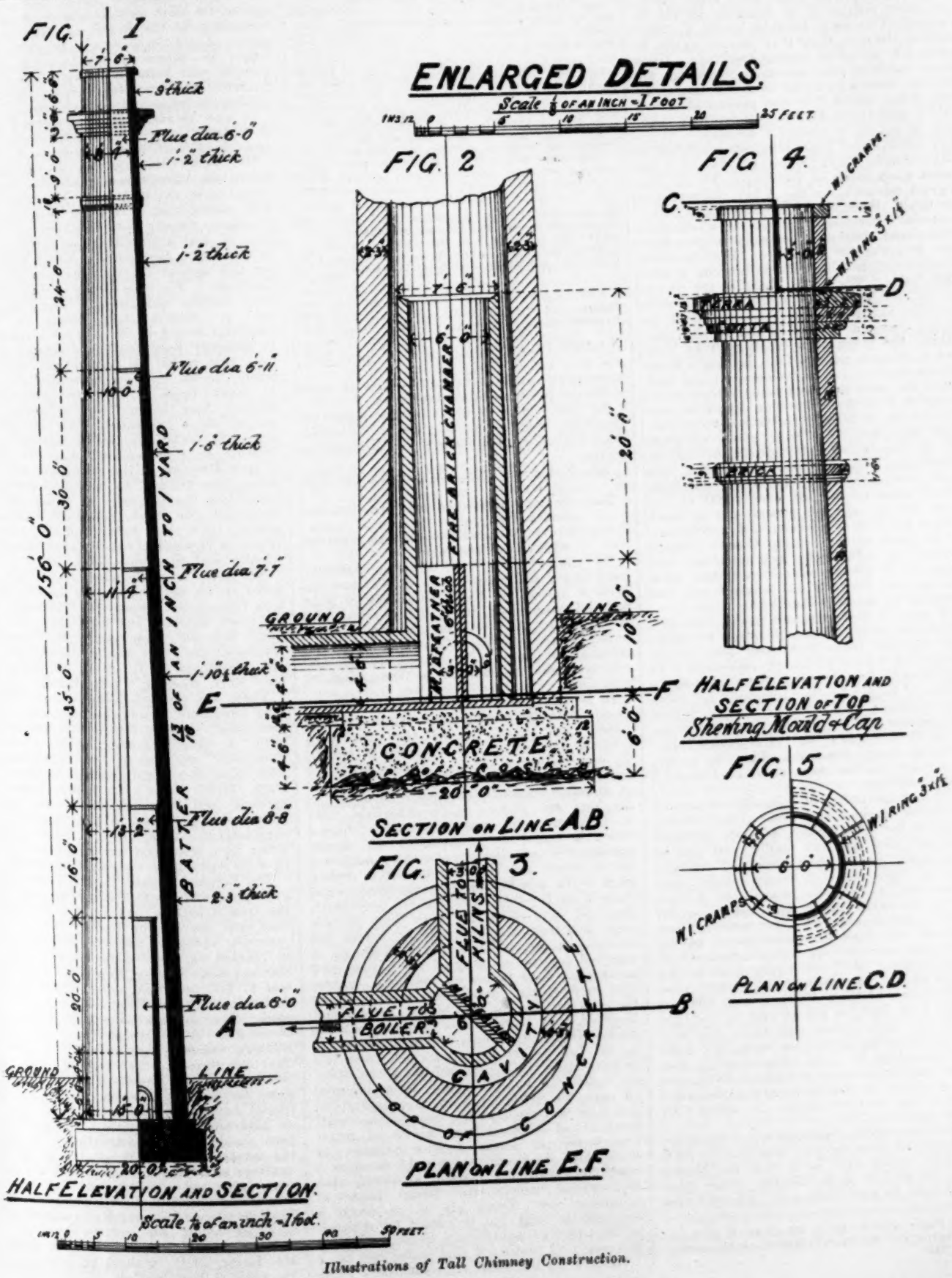
The total weight of the chimney was as follows:—

Red brickwork in shell	439½ tons.
Fire brickwork in chamber, flues, midfeather, and flooring	32 ,,
Terra-cotta moulding and cap, including wrought-iron ring, cramps, and dowels	12½ ,,
Total weight on foundations	484 tons.

The cost of the structure was materially reduced by reason of its position with regard to suitable material, both in ballast and lime, which were obtained, as we have explained, on the spot; but a similar structure, taken at current prices, could be erected for a sum not exceeding 550*l.*, or about 3*l.* 10*s.* 6*d.* per lineal foot of chimney, provided no unforseen outlay had to be incurred in obtaining a suitable foundation.

Throughout the entire building inside scaffolding was employed, thus affording shelter to the workmen, while being easy of construction and making good on removal, and a considerable saving in cost over outside scaffolding.

The work was done during the early spring of the year, and great care was taken in protecting the south-east face by covering the brickwork with tarpaulin-sheets during wet weather, and this is a most essential matter of which the writer has had considerable experience through the accidental falling of a few chimney-stacks, notably those at Cleckheaton, in Yorkshire, and at Burnley, in Lancashire, in both cases several lives being lost, and, as pointed out in the particulars written by the writer hereof, which were published at the time of the accidents, these chimneys fell to the south-east, which was attributed to the fact that during the construction the strength of the mortar on that face had been considerably weakened by exposure to the damp, and thus taking much longer to set than that of the other points of the compass fanned by the dry and



Illustrations of Tall Chimney Construction.

stronger winds from the north and western quarters.

In conclusion, I may say the chimney herein described has been in use for several years, and is in every way satisfactory, and has done the work required of it very well.

A NOTE ON HOUSING OF THE WORKING CLASSES.*

THIS is essentially not a paper dealing with the whole question, but merely a note, or perhaps it would be better described as an appeal for further consideration on the question of the advantages and disadvantages of block dwellings and cottage tenement, more particularly relating to towns

There are certain places which contain unsanitary, miserable, and dirty areas which, for every reason, it is desirable should be cleared. The only thought given to these cleared sites is that they should again be used for so-called model dwellings. Upon these valuable sites expensive buildings are erected, known as model block dwellings, the cost being about 60*l*. per person accommodated, and about 8½d. to 9d. per foot cube; this is taking a moderate estimate. Every acre takes about 1,100 persons; roadways or playgrounds, 40 ft. wide, are provided between each block of buildings. This is not a great advance for the XXth century, and no doubt these 40-ft roadways or "playgrounds" were only provided when they were found absolutely necessary to give light for a six-story building. The sanitary accommodation being used in common is most undesirable. The rents charged are 3s. to 4s. 3d. per room, and about 12s. per week for four rooms inclusive; the return on the capital being a fraction under 4 per cent. Taking the plans of a block such as those just mentioned, we find that the single rooms are planned to act as living-room and bedroom, the food cupboard being placed closed to the foot of the bed! The superficial area of this room is 150 ft. In the two-room tenement the plans show living-rooms of about 150 ft. superficial and bedroom of 120 ft. superficial, containing one double bed, one single bed, and a cot, the room containing cubical capacity of just over 1,000 ft., or about 250 ft. cube per person—not so much as they allow in our prisons and workhouses, nor so much as the London County Council demand for a common lodging-house; and please be it always remembered that these premises are designed for constant use, and occupied by working families.

If one of the occupants is ill, can you conceive a more undesirable place to reside with summer temperature and four people sleeping in a room of 120 ft. superficial? It must also be kept in mind that such tenants as occupy these premises can never get away for a holiday; they are kept pent up winter and summer always in the same condition, just a 40-ft. roadway or "playground" surrounding their dwellings. This is a fair description of the usual style of "model" block dwellings.

The cottage tenements usually consist of two floors—ground and first—giving accommodation for two families, separate entrance being provided for each family, and also in some cases, as at those excellent cottages built at Battersea (Latchmere estate), providing also a separate entrance to a back garden for each tenant; the cost being 7d. per ft. cube, and 61*l*. per room. These premises were built by direct labour, paying full wages, and include cost of artesian well, roads, sewers, etc.; everything here tended to run up the cost, and yet the scheme pays, with reasonable rents, 10s. per week for four rooms with bath, scullery; and 7s. 6d. per week for three rooms and bath, scullery; the rentals being 2s. 6d. per room, and bath, scullery, added in. The accommodation provided on this estate is for about 200 people per acre, or, if you exclude the recreation ground, the accommodation is about 267 people per acre.

Why have block dwellings when there are hundreds of acres to sell, freehold, at 500*l*. per acre within eight miles from the Marble Arch (if this is so in London, other large cities must be more fortunate), places served by at least three railways, with good train service and very cheap workmen's tickets? The Acts allow the authorities to build outside their own district, and yet they will continue to build these "model" block dwellings in the heart of confined and unhealthy districts, providing *no* gardens (always remembering they *do* provide the miserable "playgrounds" 40 ft. wide).

What would be the cost of a housing scheme within the distance above-mentioned? For calculating purposes we may take the area as being an estate of 15 acres; allowing 3 acres for recreation ground, we get the following figures:—

Capital Outlay.	£
15 acres of land at 500*l*. per acre, equals	7,500
300 tenement cottages, each accommodating two families, cost of same being 400*l*. per house	120,000
Cost of roads, sewers, artesian wells, fences, etc.	9,000
Sundries	3,500
Total cost	£140,000
Income.	
300 houses (two tenements), each floor consisting of three bedrooms, living-room, and bath, scullery, and separate conveniences, let at 6s. per week per floor of four rooms and scullery, equals 12s. per house per week	£9,360
Expenditure.	
Repairs, loss of rent, insurance	600
Repayment of loan and interest, calculated at 4 per cent. for loan for sixty years.	
Rates, etc., at 6s. in the £	6,750
Collection, caretakers, and superintendence	500
	£7,850
Income	9,360
Expenditure	7,850
Net profit per year	£1,510

showing a good net profit, which is quite sufficient for municipal enterprise.

In the above figures I have taken the following broad principles, which I consider should govern all buildings for the working classes:—

1st. Not more than 250 persons per acre of land.
2nd. No building should be more than two floors high.
3rd. Every tenement should have a garden adjacent to the house.

As shown above, no financial difficulty need arise, and there is no doubt that the present system of block dwellings is most unsatisfactory both from the physical and mental point of view, and the idea of providing small cottages with a plot of garden attached to each is an excellent one—one which ought to appeal to the mind of everyone.

It is much to be regretted that in these days, notwithstanding the rapid strides science has made, one of the three very essential factors for our existence in health, for some reason or other, is grossly neglected among many people, perhaps for the sake of supposed economy, but which, however, in the long run proves to be otherwise. *One* of *the* causes of consumption—the disease which accounts for thousands of deaths annually—is the want of this neglected factor—fresh air. It is true that a certain germ is the direct cause, but the predisposed cause is the lowered vitality of the individual. And yet how many do know that to this state a person must be brought before the disease can attack him? While fresh air is essential for the building of the tissues, and so increase their power of resistance, impure air, on the other hand, acts conversely on the system, lowers the vitality of an individual, and renders him liable to all the various forms of diseases of which this world is so full. The importance of fresh air cannot better be illustrated than the open-air treatment which is now being adopted all over the world in cases of consumption, and it is not much to say that in the treatment of all diseases fresh air is of prime importance. It seems a false economy to erect block dwellings which only serve as a breeding-ground for disease to supply the sanatoriums which are being built at enormous cost. Fresh air is as much a necessity as food, but it cannot be obtained to one's best advantage in a house, no matter however well ventilated that house may be.

In view of the great important part alone which this climate plays, as already illustrated, the theory of a small garden should receive the unanimous support of all.

Moreover, the garden has some other part to play than wherein we receive the wholesome air, for its delightful surface of green mingling with the forms and colours of nature serves a new charm for us in our perception. The influence of the forms and actions in nature is so needful to man that, in its lowest functions, it seems to lie on the confines of commodity and beauty. To the body and mind which have been cramped by labour, nature is medicinal and restores their tone. The workman comes out from the confines of impure air, out of the din and craft of the street, into the open garden where he breathes the reviving atmosphere, and sees the sky and works of nature, and is a man again. In their eternal calm he finds rest—refreshing to the body and pleasing to the mind. Again, to those who thirst for knowledge, as nature is the incarnation of a thought and turns to thought again, every moment instructs and every object, for wisdom is infused into every form.

It may be stated that the moral influence of nature upon every individual is that amount of truth that it illustrates to him.

Mr. Rider Haggard, in giving evidence before the Select Committee of the House of Commons on the Housing of Working Classes Act, stated that at a place near Waltham, in Essex, twenty men had only a shed to sleep in, and lived winter and summer under an elm tree. Personally, I would much prefer this system of "housing" to the block dwellings. The men living under the tree were healthy and strong. Pray how many out of twenty men living in block dwellings would be in so good a condition? It certainly does sound like housing on the lines that cattle are housed, but it is preferable to be thus accommodated than like so many bales of wool and other goods, stacked floor above floor, in every sense similar to a warehouse. No privacy, no home life, nothing to take an interest in, and driving, as it of necessity must, the people to seek diversion in the gin-palaces and other undesirable places. To fully understand and appreciate the pleasures of living in block dwellings, one should spend at least twelve months there; you would find that existence is almost impossible without week-ends in the country and good long holidays.

No parks or public open spaces will ever make up for the lack of pure air and brightness immediately around the dwellings; they are most desirable and necessary. We must not, however, counteract the beneficial results arising from them by building unsuitable dwellings 50 ft. or 65 ft. high, with only 40-ft. roads or "playgrounds."

There are some excellent examples of cottage tenements in addition to those already mentioned; those at Camberwell are provided with a small garden. The Artisans', Labourers', and General Dwellings Company, Ltd., have done some excellent work at Noel Park, Wood Green; the houses have small gardens, and it is pleasing to see that in some cases the elevations have received more consideration than usual. The Peabody Trust have also good examples (the pantries in some cases have no proper ventilation).

The London County Council have erected some good cottages at Tooting; unfortunately the area at back is very small. (I must add here that the London County Council have certainly added to the architectural beauty of London by their model dwellings.) At Southampton cottages have been built at a cost of 67*l*. per room, whilst their ugly undesirable block dwellings cost over 116*l*. per room. The cottages have most satisfactory elevations. At Eastleigh the L & S. W. Railway Company are providing houses for their employees; the gardens are most pleasing, but the elevations might have had some further consideration. (The food cupboards have no proper ventilation.) As far as Manchester is concerned, every member here should take the opportunity of seeing the houses at Blackley estate. It is particularly satisfying to observe that the elevations have had consideration; but why no proper ventilation to food cupboards? Port Sunlight should be carefully examined as an excellent model for country housing. No one can realise the excellent work done by Mr. Lever, M.P., without an inspection of his work at Port Sunlight.

* A Paper read by Mr A. Alban H. Scott before the Institute of Sanitary Engineers at Manchester, July, 1906.

In conclusion, may I express my most sincere hope that block dwellings are a thing of the past? They can be conveniently converted into good warehouses. No money need then be wasted.

THE ARCHITECTURAL ASSOCIATION.

THE following are the papers announced for the ensuing session of the Architectural Association :—

October 5.—Annual General Meeting. President's Address and Distribution of Prizes. Mr R. S. Balfour, F.R.I.B.A.
October 19.—The Architecture of the Roman Empire. (Illustrated by lantern views.) Mr. Alan Potter.
November 2.—Axiality in Architectural Composition. Mr. H. Stannus, F.R.I.B.A.
November 30.—The Difficulties which beset an Architect in London, with Special Regard to Existing Legislation. Mr. W. Woodward, F.R.I.B.A.
December 14.—Architecture of Sicily. (Illustrated by lantern views.) Mr. W. Howard Seth-Smith, F.R.I.B.A.
January 11.—(Subject to be announced.) Mr. Temple Moore, F.R.I.B.A.
January 25.—(To be announced.)
February 8.—Regent-street. Mr. Mervyn E. Macartney, F.R.I.B.A.
February 22.—Training and Workmanship. Mr. Gerald C. Horsley, F.R.I.B.A.
March 8.—Spanish Architecture. (Illustrated by lantern views.) Mr. A. N. Prentice, F.R.I.B.A.
March 22.—Sanatoria. Mr. Edwin T. Hall, F.R.I.B.A.
April 12.—Westminster Cathedral. Mr. J. A. Marshall.
April 24.—Theatres. Mr. Frank T. Verity, F.R.I.B.A.

The Council of the Association intend to try the experiment this year of issuing, at the end of the session, a bound volume containing all the Sessional Papers, provided the scheme receives promise of sufficient support.

Archæological Societies.

EAST RIDING ANTIQUARIAN SOCIETY.—On the 27th ult. the East Riding Antiquarian Society varied their programme by an incursion into Lincolnshire, visiting South Ferriby Church and Horkstow Hall. About fifty members attended, the President, Lord Liverpool, being of the party. At South Ferriby the vicar, the Rev. J. Spawforth, met the visitors, and conducted them round what is left of the church of St. Nicholas, which, having been built on the slope, is presumed to have been ruined by slipping down the ground. The most interesting portion of it remaining is the Tympanum, assumed to be of XIth or early XIIth century date. Mr. Wright Taylor suggested that the Tympanum had come from the east wall of the old church. It illustrated the bishop anointing the Cross, as the Ritual prescribed. The bishop depicted would probably be the bishop of the diocese at the time the stone was erected, which, he should say, would be about the year 1120. Mr. Shepherd described the church, remarking that the foundations extended a good way towards the main road. In the tower were a number of fine old bells, but it was difficult to say what the original church was like by reason of the many alterations from time to time. The tower was worth notice, for by some it was thought to go back to the Saxon period. It was built of local chalkstone, and had been cased with bricks. Subsequently the party proceeded to Horkstow Hall to view the Roman pavement uncovered in 1797, and of which the late proprietor of the hall, Mr. Calthrop, had made a special study. It contains various representations of men and animals. The party subsequently visited Saxby, Bonby, and Worlaby Churches.

COUNCIL SCHOOL, HALIFAX.—The first elementary school erected at Halifax since the Town Council became the education authority was formerly opened on the 3rd inst. The new school is situated at Salterhebble, near the Huddersfield-road, and is a stone structure. There are five classrooms and a babies' play-room. Entering the building, there are lavatories; an 8-ft. wide corridor gives access to the lavatories, cloakrooms, and classrooms, and also to an assembly-hall, which is 40 ft. by 24 ft. The building is heated on the low-pressure hot-water system, with radiators, and ventilated by extracting ventilators. In the playground there are two covered play-sheds. The total cost of the buildings and furniture is 5,370*l*. The buildings have been erected according to the plans of Mr. J. Lord, the Borough Engineer.

ACQUISITIONS BY THE BRITISH MUSEUM.

IN his Report on the general progress of the Museum in 1905, Sir E. Maunde Thompson, Director and Principal Librarian, states, *inter alia*, that the excavations which have been in progress since 1903 on the site of ancient Nineveh were brought to a close in February, 1905. The mound of Kouyunjik has now been fully explored, testing trenches having been cut in all directions in order to be sure that no remains have been overlooked. The principal recent discovery is the site of the Temple of Nabu, the War God. The ruins were cleared, but the building had been so utterly destroyed and burnt, presumably by the Elamites at the capture of the city, that it was not possible even to make a complete plan of it. The library of tablets which it probably contained must have been entirely destroyed. So thorough, indeed, was the destruction of the city by the conquerors, to judge from the conditions of the remains, that the preservation of the collection of tablets now in the Museum, and forming only a part of the great library of Sennacherib and Ashurbani-pal, must be attributed to some accidental falling-in of *débris*, which thus covered them and saved them from the enemy.

The excavations on the site of the Temple of Artemis at Ephesus were brought to a close on June 17. The result of the two seasons' excavations is as follows:—The remains of four temples, superimposed one on another, have been examined. Taking these temples in order, from the latest to the earliest, they are:—(1) The temple of the middle of the IVth century B.C., which was the main object of Mr. J. T. Wood's exploration. Mr. Wood removed almost every relic of it, and his work proves to have been very thorough. The remains which he discovered are those now in the British Museum. (2) The temple built in the middle of the VIth century B.C., usually associated with the name of Crœsus, was the original object of the recent exploration. This temple was only touched by Wood. The whole area of the surviving platform has now been cleared, and, from the numerous fragments recovered, an architectural restoration of all except the architraves will be possible. (3) The third temple, the existence of which has been hitherto unsuspected, was very little below the level of the one above, and was of smaller area. Only small traces of it remain, and its period of existence was probably short. (4) Of the lowest and earliest temple, the structure of what may have been the naos or statue-base alone remains. The lowest blocks of this structure are laid on the virgin sand. It was here that numerous objects of gold, ivory, etc., were found. From the style of these objects it is inferred that the period of this earliest temple was probably not earlier than the VIIth century B.C.

A list of acquisitions made by the Museum in the department of Egyptian and Assyrian Antiquities has been prepared by Mr. E. A. Wallis Budge, Litt.D., and it includes the following:—The south wall of the chapel of the largest and most important pyramid of the northern group of the pyramids of the Island of Meroë in the Sudan. This pyramid was built for one of the great Queens of Meroë, who bore the title of "Candace," probably during the first or second century of the Christian era, and its chapel and forecourts and pro-pylons were sculptured with elaborate reliefs, representing the Queen's funeral procession, the offerings made in the tomb, etc. The Queen's name is nowhere found on the walls in hieroglyphics, and the cartouches, which are sculptured in high relief, and in a very prominent place, have not been filled up. At one end of the wall the queen is seen seated by her consort, whose name also is unknown. She wears a fringed garment, with ropes and tassels, and on her arms are elaborately ornamented armlets. The reliefs on the other portion of the wall represent a table of offerings, the Hall of Osiris, the Judgment Scene, rows of divine and other figures making offerings and pouring out libations before the Queen, who is also seen leading four bulls for sacrifice. The reliefs on the wall are typical of the best class of funereal sculpture in the Island of Meroë, of which, before the arrival of this object, there was no example in the national collection (presented by the Government of the Sudan, 1905). A handsome rectangular limestone slab from the door of the tomb of Pari, a priest of Ptah, and overseer of the estates of the god Amen-Ra of Thebes. The deceased flourished in the reign of Amen-hetep III., about B.C. 1450, and an interesting throne name of this king is inscribed on the slab (presented by Mr. Robert Bond).

In the department of Greek and Roman Antiquities the additions to the collection include three fragments of columns in green limestone, decorated with zigzag bands and spirals. These fragments form the greater part of the two columns which stood on either side of the entrance to the "Treasury of Atreus" at Mycenæ (presented by the Marquis of Sligo); three plaster casts of fragments of a column and of the capitals of the two Mycenæan columns (presented by the Greek Government); and plaster cast of a fragment of one of the capitals of the Mycenæan columns (presented by the Karlsruhe Museum).

Mr. C. H. Read's catalogue of the acquisitions to the department of British and Mediæval Antiquities in 1905 includes the following items:—A model of Stonehenge; four late-Keltic cinerary urns, one of the pedestal type, from Rochester, given through the National Art Collections Fund; an alabaster carving, representing the Resurrection, in exceptional preservation, with gilt and coloured ground, English work, about 1500; four mortuary crosses of lead, found with many others in graves on the site of Christ's Hospital, City of London; ancient Buddhist figures in bronze and inscribed plinth, from Bezwada, given by the Secretary of State for India; wooden screen with inscriptions in Chinese, Tibetan, Mongolian, and Manchu, recording the dedication of a figure from Lhasa in the Great Lama temple at Pekin; a number of brass, copper, wood, and stone figures of deities, many containing manuscripts and charms, temple-vessels, pictures, furniture, and book-covers, idol ornaments and charms from Lhasa and monasteries in Tibet, collected by Col. H. A. Iggulden during the expedition in 1904; a series of objects illustrating the ethnography of Corea, including temple furniture and ancient bronze bowls from the tombs of the Kuru dynasty at Taiku, Corea; an extensive and important series of steatite carvings in human and animal form, together with iron weapons and ornaments, and a large number of fragments, collected on the site of the ruins at Umtali, Rhodesia, given by the Rhodes Trustees; a collection of great interest representing the contents of a Juju-house in a mangrove belt near Allabia in the Andoni country, Southern Nigeria, which was destroyed by the Government in consequence of human sacrifices which had taken place there, the collection including a large ivory horn, ornamented with four human skulls, a skull ornamented with goat skulls, ceremonial swords and spears, and figures of cast-bronze, showing considerable skill in workmanship, together with a large series of *manillas* of various sizes, some particularly large and ornamental, given by the Government of Southern Nigeria.

Obituary.

ALFRED STEVENS.—We regret to record the death, on the 24th ult., at Paris, of M. Alfred Stevens, a painter who, though a Belgian by birth, may be said to have belonged to the French school, as he came to Paris at an early age, and was a pupil first of Navez and afterwards of Camille Roqueplan. He was a painter of figures, of sea-pieces, and of landscape; but his real reputation rested on his paintings of modern ladies of the Parisian type. Stevens exhibited for the first time in 1850, and since then had sent regularly to the annual exhibitions. A good draughtsman and a brilliant colourist, he became one of the painters most sought after in his time for "scènes d'intérieur," and his pictures of this class, in regard to physiognomy, fashions, and costume, are really authentic documents of the epoch in which he worked most, from 1850 to 1880. For several years he had lived a very retired life, completely apart from the artistic world in which he had formerly been a prominent figure. Stevens obtained a Third Medal in the Salon of 1853, and a Second in that of 1855. He became a member of the Legion of Honour in 1863, and was promoted Officier in 1871, and Commandeur in 1878. Stevens, who was born at Brussels, was 78 at the time of his death.

MR. CHARLES.—We regret to announce that Mr. James Charles succumbed to a surgical operation on August 27, at an early stage of his highly successful career. Mr. Charles was an Associate of the Société Nationale des Beaux-Arts, and was a frequent exhibitor—mainly of interiors and landscapes—at the Salon, the Royal Academy, and the New Gallery.

MR. LEDGER.—The death, on September 2, the result of an accident, is announced of Mr. Frederic William Ledger, of Ashton House, Epsom, aged 50 years. Mr. Ledger was elected an Associate of the Royal Institute of British Architects in 1882. He was architect of the Conservative Club-house at Epsom (1898), and of a new factory for Messrs. R. H. & S. Rogers, at Cliftonville, Bolena-road, Bermondsey. Eight years ago he prepared the

plans and designs for the rebuilding of No. 24, Brook-street, Grosvenor-square; and he was, as we gather, the architect of the Wesleyan church in Parchmore-road, Thornton Heath, designed after the Perpendicular style, for a total of 650 sittings, and with a corridor for connecting the church with the future schools.

MR. SAMPLE.—The death, on August 27, at his residence, Bothal Castle, Northumberland, is announced of Mr. Thomas Sample, who succeeded his father as land agent to the Duke of Portland, having previously been joint agent with his father in that capacity. Mr. Sample conducted an extensive practice as an arbitrator and in connexion with landed properties in the locality.

Correspondence.

FOTHERINGHAY CASTLE.

SIR,—In your report on August 18, p. 227, *ante*, of the Architectural Association annual excursion it is stated that—

"The original plan of the castle is quite undecipherable, and no drawings or plans exist, so far as is known, either in the British Museum or the Record Office."

In the Stewart Exhibition, 1889, were shown three of the whole-length portraits of Mary Queen of Scots, known as the "memorial type," lent respectively by Queen Victoria, Blair's College, Aberdeen, and the Earl of Darnley. In the background of each picture is represented the execution of sentence upon Queen Mary with a view of the interior of "*Avla Fodringhamii.*" A similar "memorial" portrait was sold at Christie's many years ago. Sir George Scharf's essay on the pictures is printed in the Society of Antiquaries' *Proceedings*, 1876. I do not know whether the authenticity of that view of the interior of the hall (re-erected at Cunnington) has ever been accepted. A survey of April 3, 1625, describes the castle as a capital house built of stone, having a double moat (the river Nene to the south and the mill brook to the east); a gate and forecourt to the north; a fair court within, with the chapel and lodgings; the hall on the first ascent; the keep, having lower and upper chambers, on the mound or second ascent to the north-west; great dining-room, buttery, kitchen, brew-house, etc.; and specifies the New Inn or Old Stone House. Confer also Bridge's *Northamptonshire*, Willybrook Hundred, and Cuthbert Bede's (the late Rev. Mr. Bradley's) *Fotheringhay, and Mary Queen of Scots*, 1886. D.-M.

THE REFLECTION OF A RAINBOW.

SIR,—Some time ago there was some correspondence in the *Builder*, in which I took part, concerning the effects of light upon water in landscape, and, among other points, the reflection of a rainbow was discussed, some doubt having been cast upon the possibility of such a reflection. It may be of interest to state that I had the other day a good opportunity of testing this point. I was standing on the north bank of the river here, and a very brilliant rainbow developed to the southward. The river at this point is about 30 yds. in width, the banks at the time rising about 10 ft. above the water level. The conditions were not quite perfect, the surface being slightly disturbed by tide eddies and some scattered rain; but the further bank was distinctly reflected, and the image of the rainbow was very clearly visible beneath it; sufficiently so, in fact, to enable me to distinguish plainly the divisions of the prismatic colours.

This was not, of course, a suitable opportunity of testing the effect when the apparent position of one extremity of the rainbow is actually over the water—a much larger expanse of water is obviously necessary for this purpose; but I see no reason for doubting that, under these circumstances, the reflection would also be seen, as is represented in Mr. Keeley Halsewelle's picture of Loch Awe, previously referred to by me.

E. P. STATHAM.
Commander R.N.

Arundel, September 4.

*** The question arose out of a remark in Sir Montagu Pollock's book, "Light and Water," reviewed under that title in our issue of July 23, 1904. Sir M. Pollock held that a rainbow, not being an actual existence, but only an optical appearance, was not capable of causing a reflection. We said at the time that we could not follow his reasoning, and we thought his conclusion improbable.—ED.

Illustrations.

ST. MARY'S CHURCH AND PARISH HALL, JOHANNESBURG.

THE work of designing this large and important church, together with the large parish room adjoining, was placed in the hands of Mr. George H. Fellowes Prynne, F.R.I.B.A., of Westminster, in 1903.

It was determined that, while both buildings should be considered and designed as one scheme, it would be best to carry out the parish hall first, so that the hall might be used for services whilst the church was being built. Consequently the parish hall was commenced in May, 1904, the foundation-stone being laid by Lord Milner on September 4, 1904, and the building being completed and opened for service on November 1, 1905.

The hall consists of a large building, having a length of 135 ft. and a breadth of 65 ft. Aisle passages and narrow galleries are formed in the recessed arcades on either side. A large gallery is placed at the west end, under which the various offices, entrance lobbies, committee and cloak rooms are formed. The hall accommodates 1,500 adults. In the two flanking towers at the west end are placed broad staircases leading to the galleries. A platform or stage 41 ft. by 31 ft. is arranged at the east end, with galleries on either side, one for the organ on the north side, and another for a choir on the south side. The roof is of elliptical barrel form, and is found to be excellent from an acoustic point of view. The roof above the boarding is constructed in steel, and the external covering for both the main roof and the western turrets is in copper. The total cost of the hall was about 38,000*l.*, the work being carried out by Messrs. Templar Brothers, contractors, Johannesburg, under the careful personal superintendence of Mr. E. T. Price, who, it may be remembered, acted as clerk of works at Truro Cathedral. The copper roofing was carried out by Messrs. Braby & Co., of London, and the electric fittings were supplied by Messrs. Singer & Son, of Frome.

The church, which it is hoped may be shortly commenced, is placed in the most commanding position, with its west front facing on Hoek-street and the north front on De Villiers-street. The main entrance (two large double doorways placed under a large central archway) is at the west end, above which is a circular traceried window 18 ft. in diameter and a large carved rood, with attendant figures in the gable, the whole west front being flanked by turrets. A tower with copper spire, rising to a height of 250 ft., is placed at the north-west corner, a second large entrance occupying the base of the tower. A cloister or covered way connects the parish hall with the church at the south-west corner, and over this cloister is formed a chapter-house, also connected with both the hall and church.

Immediately on entering the western doors a narthex is arranged under the western gallery. A baptistry is placed at the west end of the south aisle, and is arranged with an immersion font as well as an ordinary font.

The nave, which is divided into six bays, is 119 ft. long by 40 ft. wide. Broad aisles with double transepts are thrown out on either side, north and south, a small chapel being placed at the east end of the north aisle. Separate entrances are arranged for both transepts. The chancel, which is raised six steps above the nave level, is of the same width as the nave, and is divided into two bays. The choir occupies a central space, leaving a proper space for passages on either side. A lofty arch divides the chancel from the sanctuary. An elaborate reredos is carried high up into the east wall, and a five-light window is placed in the gable above. The length of the chancel and sanctuary is 62 ft., so that ample space is obtained for the twelve steps leading to the altar.

A rood with the usual figures of Christ, the Blessed Virgin, and St. John is designed to hang from the chancel archway, which rises to the whole height of the church.

A spacious organ chamber and vestries and sacristy are placed on the south side of the chancel, and a second corridor connects this portion of the church with the parish hall.

The total height of the interior of the church from the floor is 70 ft. The roof is of barrel form groined out over the clear-story windows. The nave floor slopes upward 18 in. from the chancel step to the west end. Accommodation is arranged for 2088 adults.

The materials used will be similar to those in the parish hall, *i.e.*, all stone dressings in ashlar of an excellent local stone of warm yellow colour; steel-constructed roof with boarding under, and externally covered with copper. Every possible precaution has been taken in the case of the hall as to thorough ventilation, and so far it has been found to be entirely successful. It may be mentioned that it was by the special request of the committee that the design was made English in character and style, with the view of marking historically English occupation and the connection of the church with the Anglo-Catholic Communion.

PORCH AT SCHOOL, CHIPPING NORTON.

THESE schools were built with rubble oölite stone, dressed and weathered with Tainton freestone. Mr. W. Aumonier did the carving, and Mr. Starkie Gardner the wrought-iron hinges and lock furniture.

The architect was Mr. W. H. Seth-Smith.

TOWER FOR A STAFFORDSHIRE VILLAGE CHURCH.

THIS tower was designed to complete the church of St. Paul's, Croxton, near Eccleshall, Staffordshire. It was to have been built of the local red sandstone to match the rest of the church. As the ground available was very limited and the floor space was required for a baptistry the stair to the ringers' level was arranged outside.

Owing to the death of the vicar of the parish, whose suggestion it was, the scheme has so far not been carried out.

F. FORBES GLENNIE.

THREE CHAPELS.

OF the three small chapels illustrated that at Belclare is a private memorial chapel in a very beautiful situation on the west coast of Ireland. It has lately been completed by Messrs. Alex. White & Sons, of Liverpool, Mr. Hunt being the resident foreman. The material used was local limestone, with Runcorn stone-dressings and Westmorland slating. No timber is used in the building except for doors and furniture, the roof being a concrete barrel vault, to which the slates are nailed. The east window is filled with stained-glass by a brother of the architect, and two side-lights are now in hand. The total inclusive cost was 650*l.*

The English chapel at St. Raphaël is approaching completion under the supervision of M. Henri Lacreusette, resident superintending architect, the builder being M. Felix Mantel, of St. Raphaël. The design illustrated shows the scheme originally proposed. The actual building has been carried out on a somewhat different plan, difficulties having arisen as to rights of light and approaches. The chapel is of the simplest possible character, built of local stone stuccoed, with tile-dressings, and hollow brick vaulting to the aisle, the nave having a flat painted ceiling of wood. The chapel seats eighty people, and is costing about 500*l.*

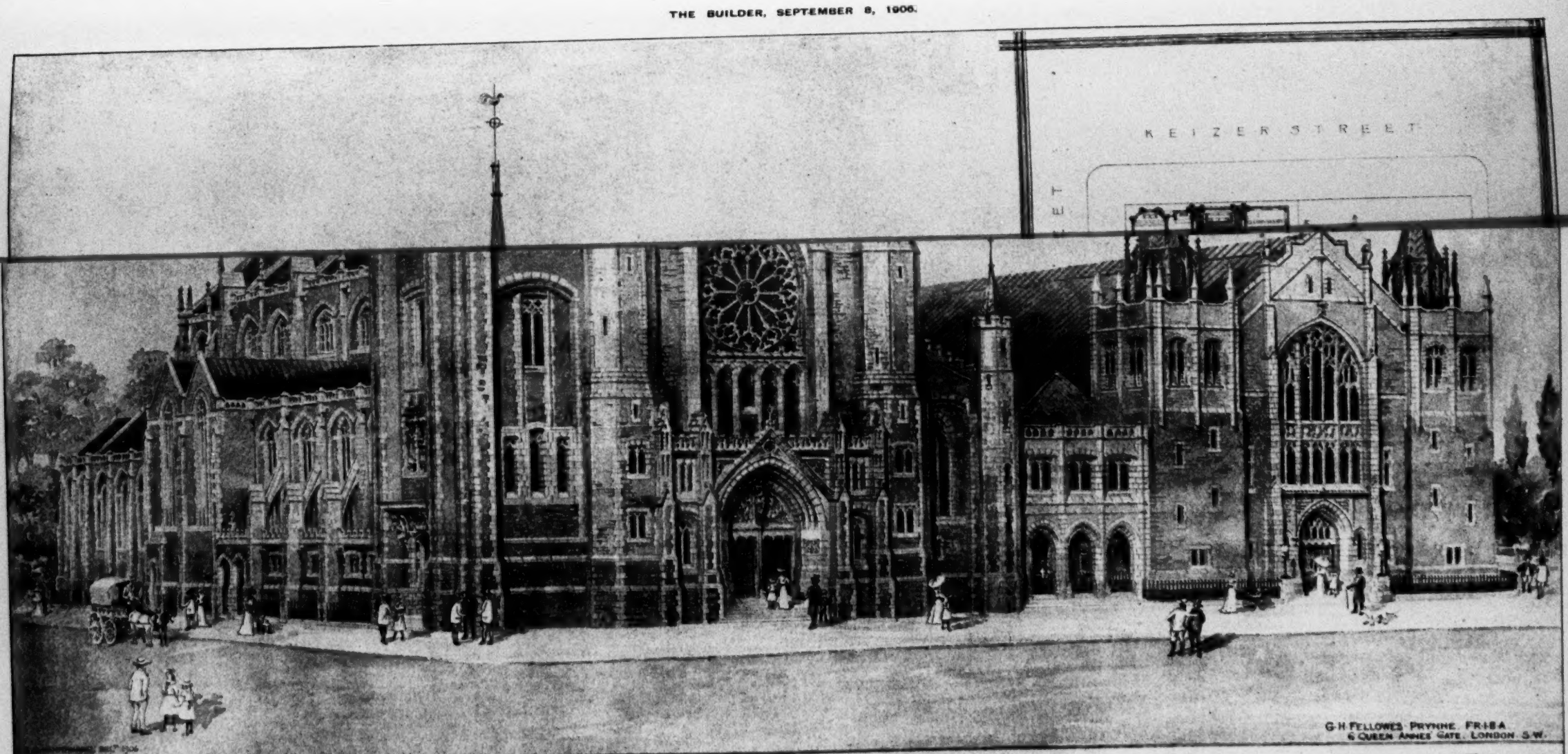
The chapel at Curbridge (Oxon) is being built of Brisenorton stone with a pantile roof by Messrs. Barnes & Son, of Witney. It replaces a schoolroom-chapel built about eighty years ago, and stands in a pretty churchyard with old yew trees. When completed the chapel will hold eighty people, and will have cost about 600*l.* inclusive of everything.

CHARLES A. NICHOLSON.

BOOKS RECEIVED.

BRITISH RAINFALL, 1905. By Hugh Robert Mill. (Edward Stamford. 10s.)

LONDON TOPOGRAPHICAL RECORD. Vol. III. (London Topographical Society.)



Proposed New Church of St. Mary, Johannesburg with connecting Cloister & Parish Hall.

BLOCK PHOTO. SPRAGUE & Co. LTD. 4 & 5 EAST HARDING STREET, FETTER LANE, E.C.

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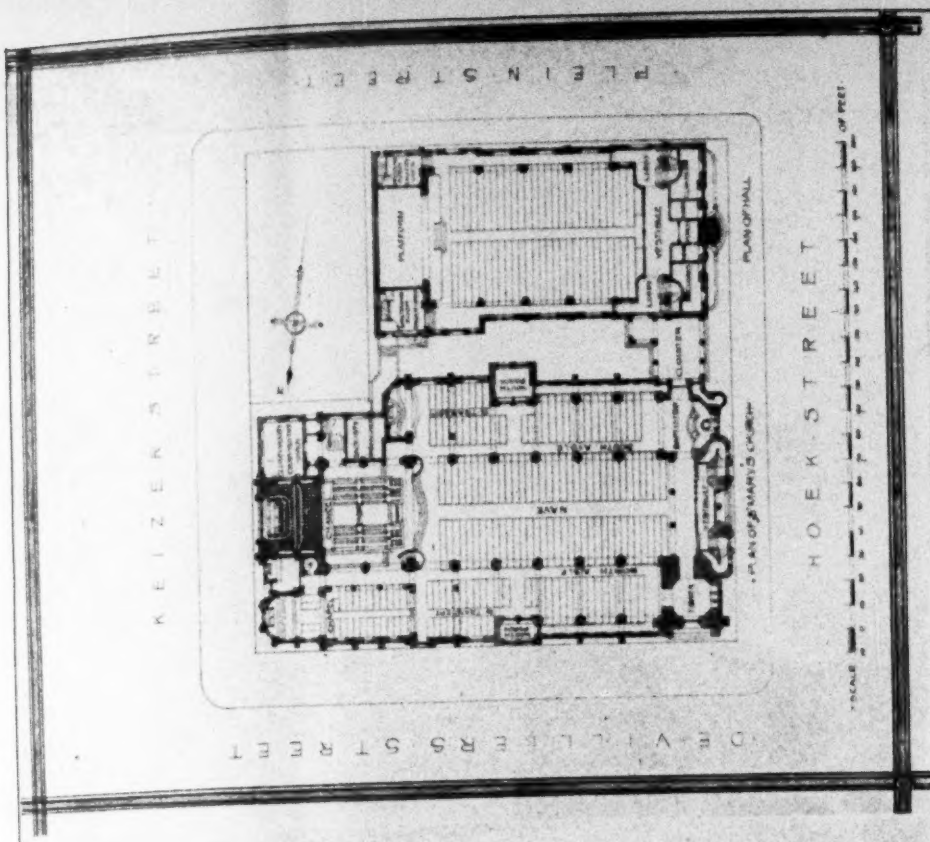

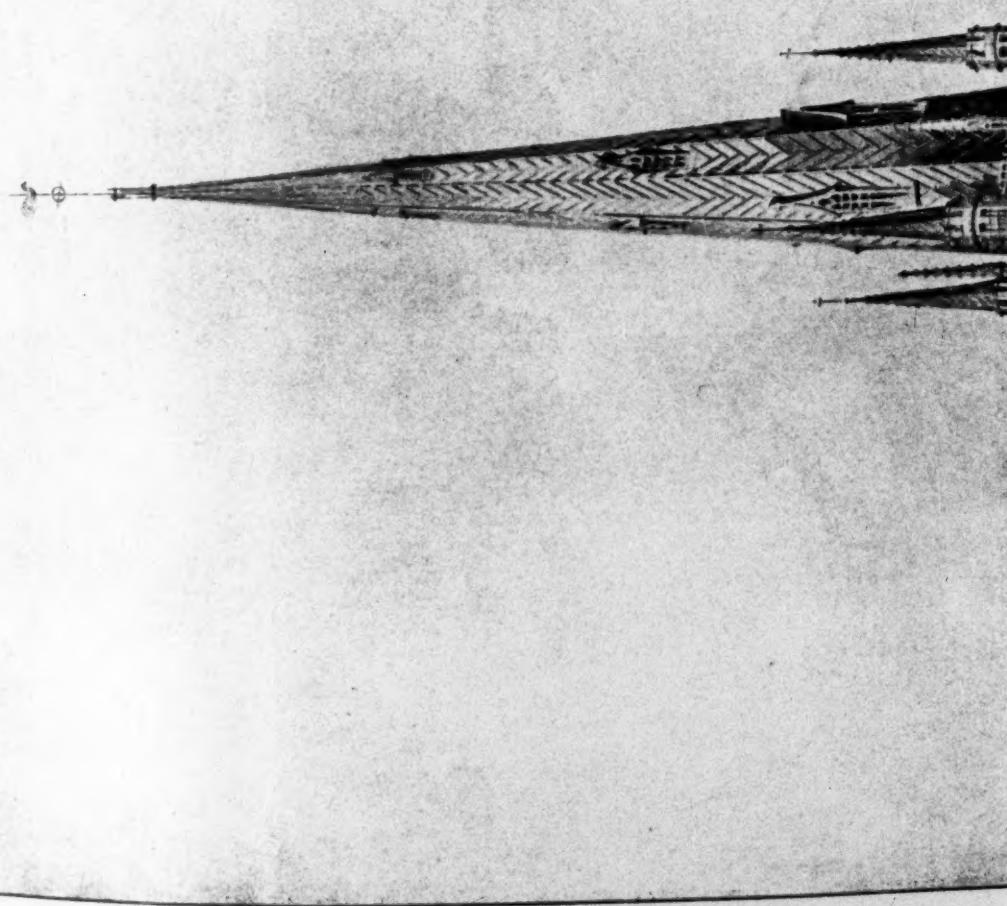

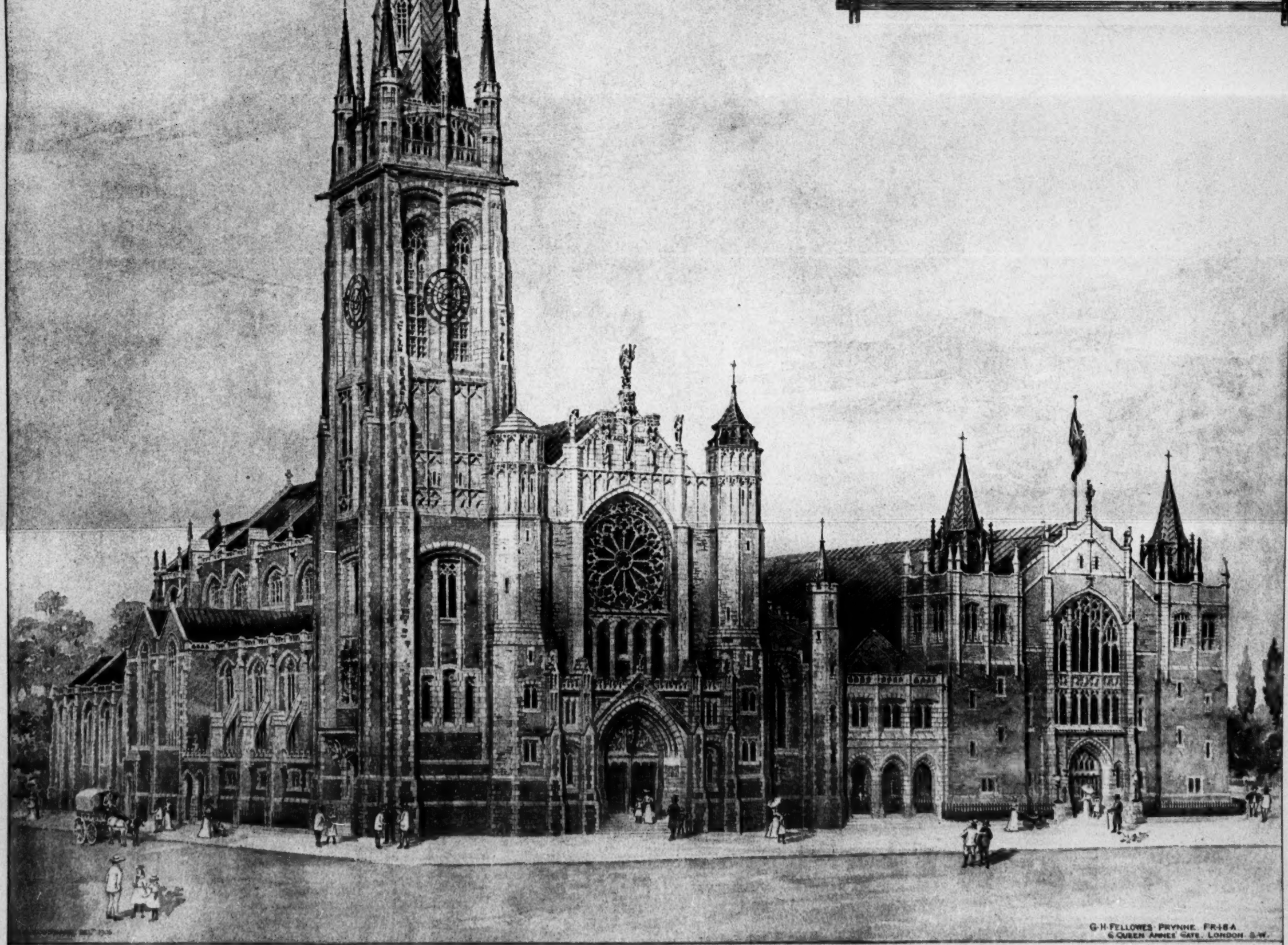

G.H. FELLOWES PRYNNE. FRIBA
6 QUEEN ANNES GATE. LONDON. S.W.

Proposed New Church of St. Mary. Johannesburg with connecting Cloister & Parish Hall.

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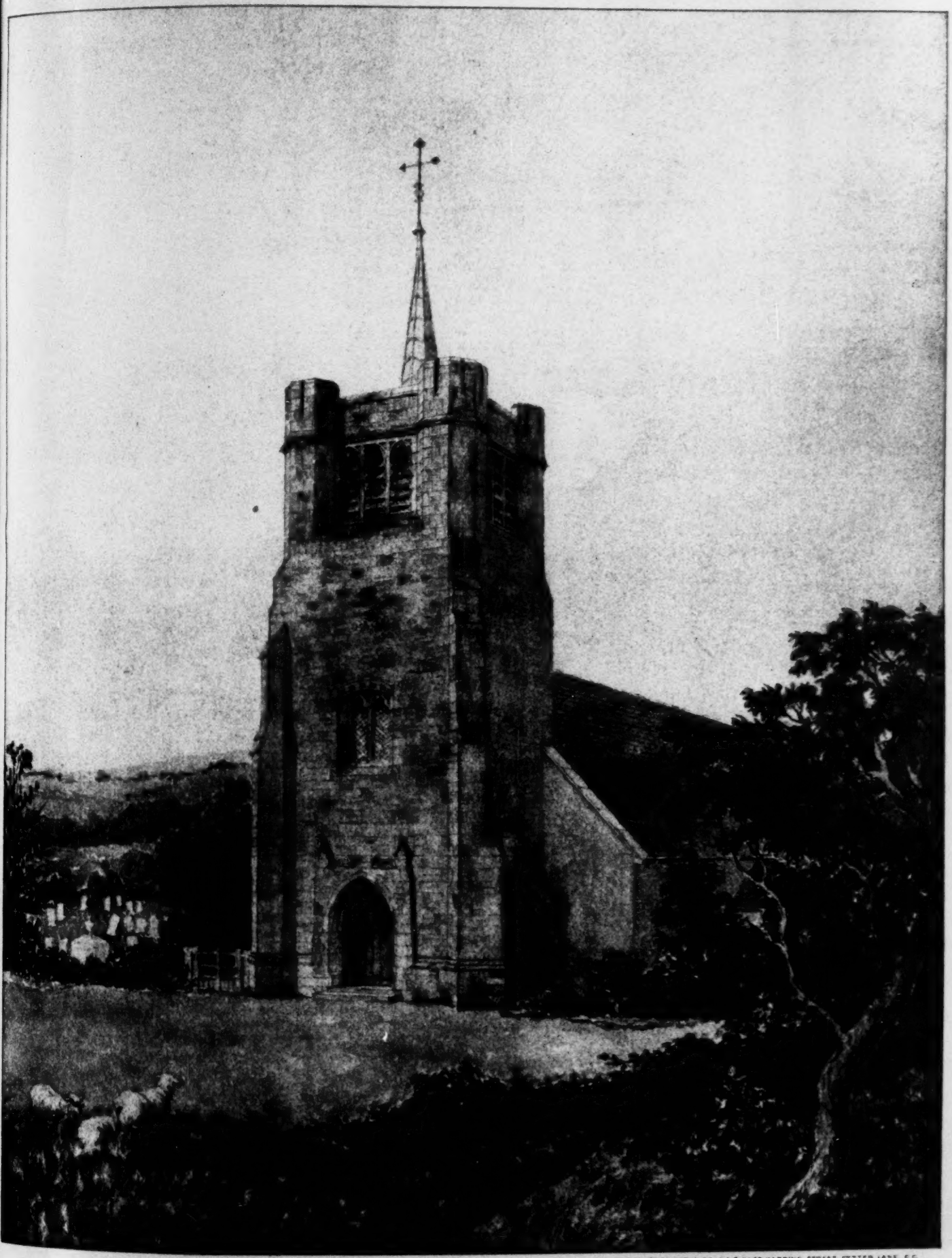
INK-PHOTO, SPRAGUE & Co LTD 4 & 5, EAST HARDING STREET, FETTER LANE, E.C.

PORCH AT SCHOOL, CHIPPING NORTON.—Mr. W. H Seth-Smith, F.R.I.B.A., Architect.



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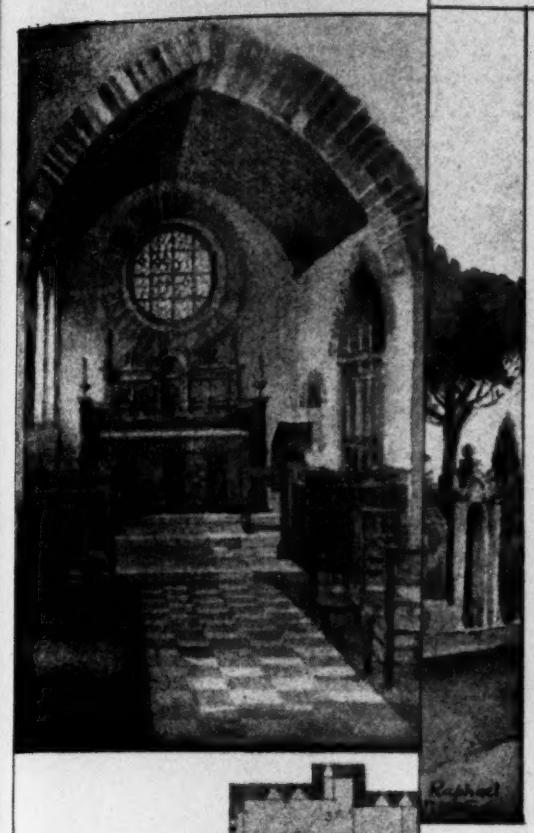
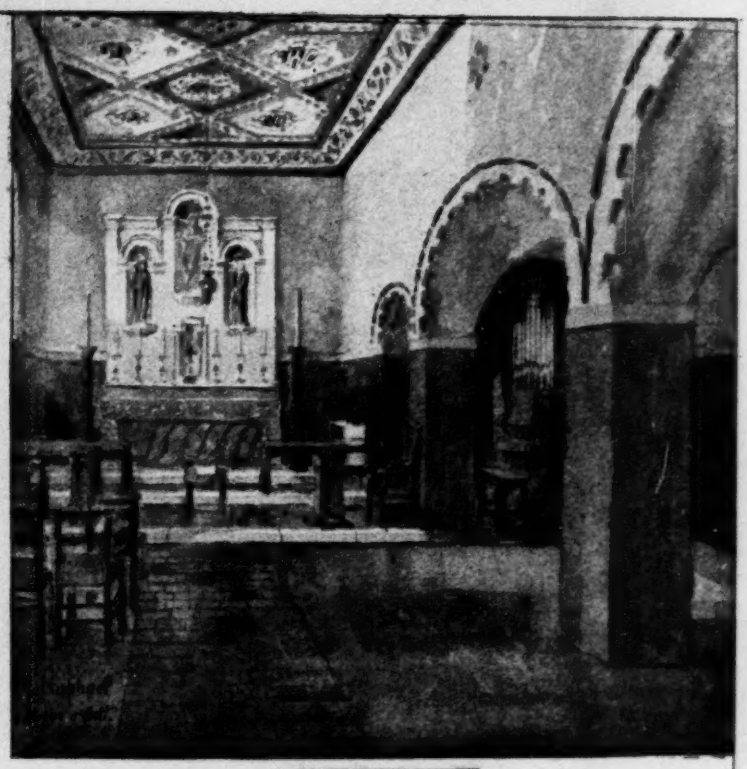
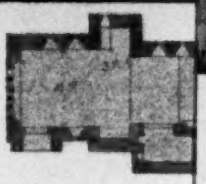
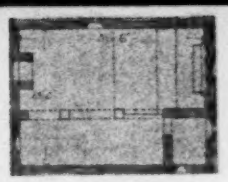
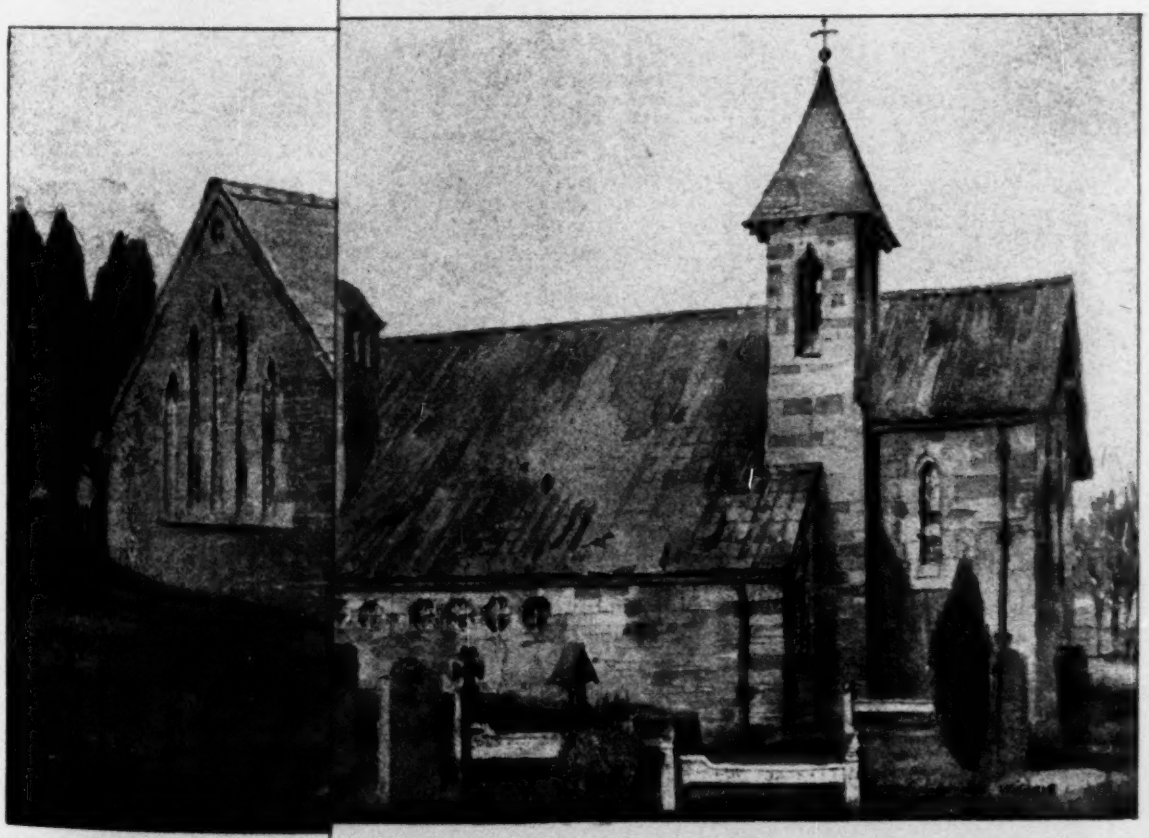
TOWER FOR A STAFFORDSHIRE VILLAGE CHURCH.—Mr. F. F. Glennie, Architect.











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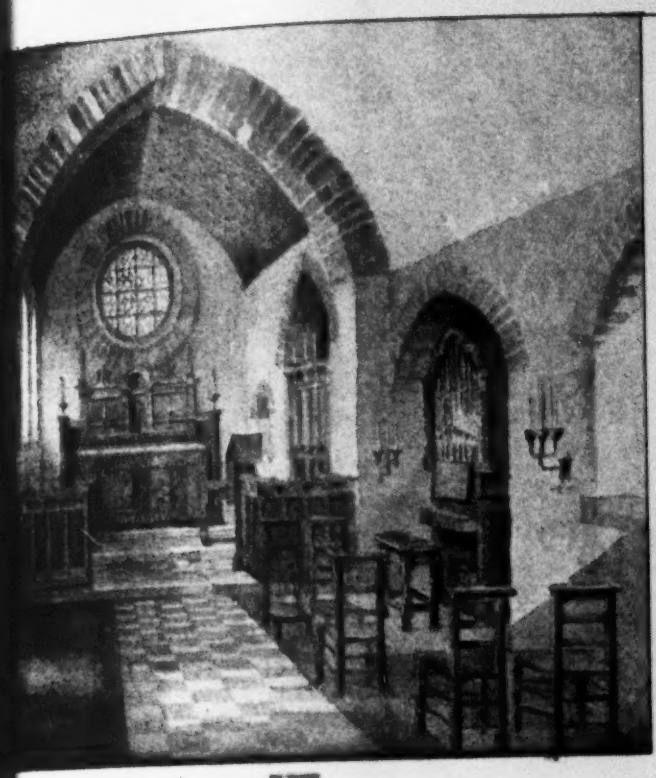
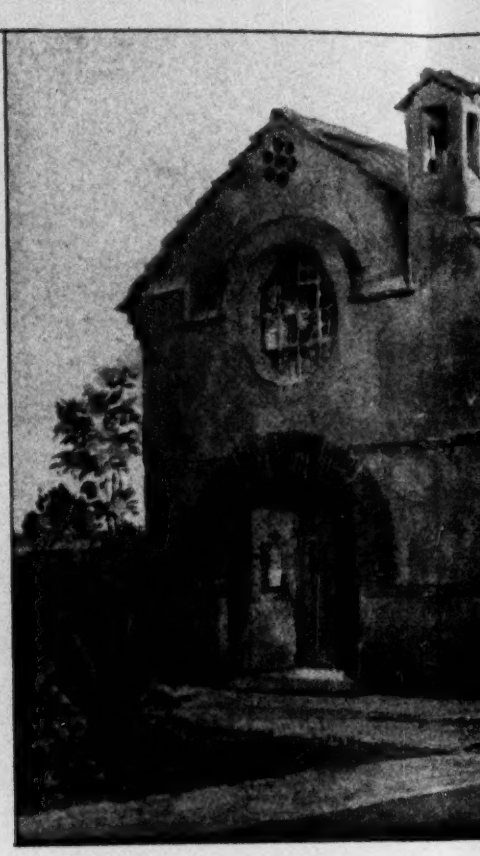
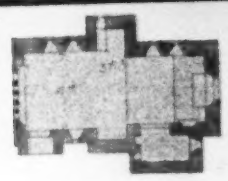
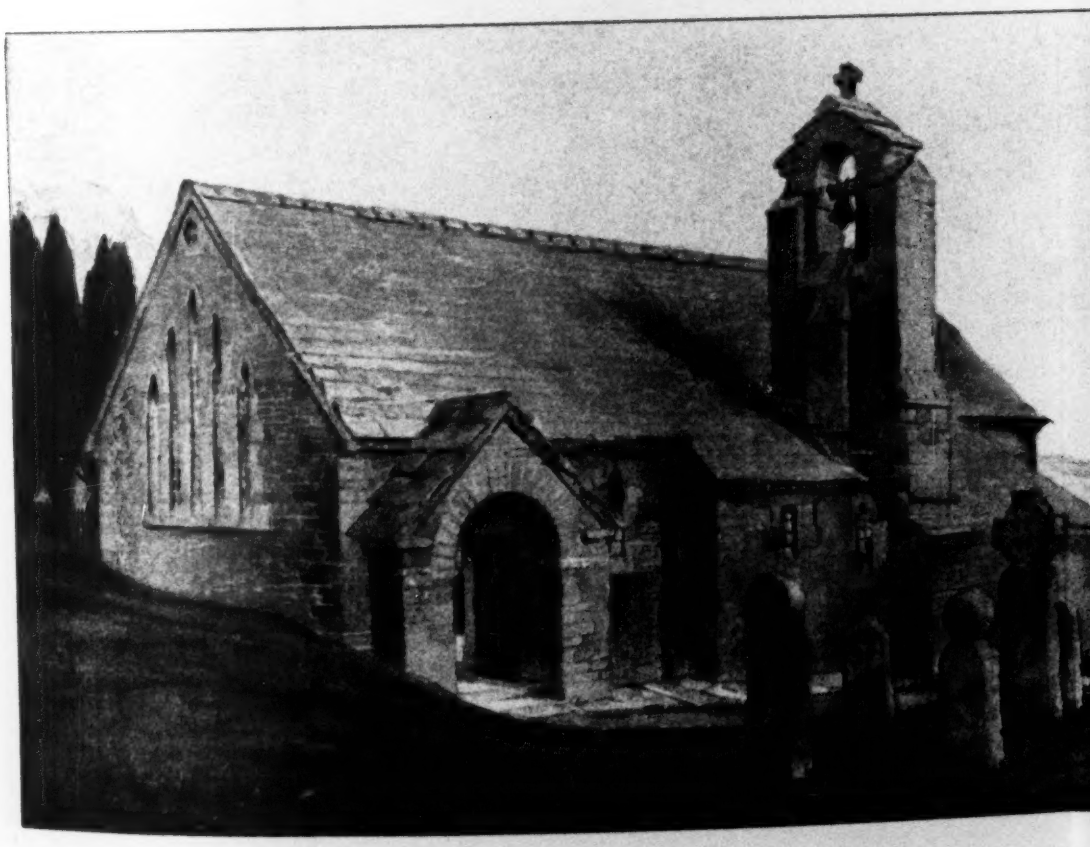
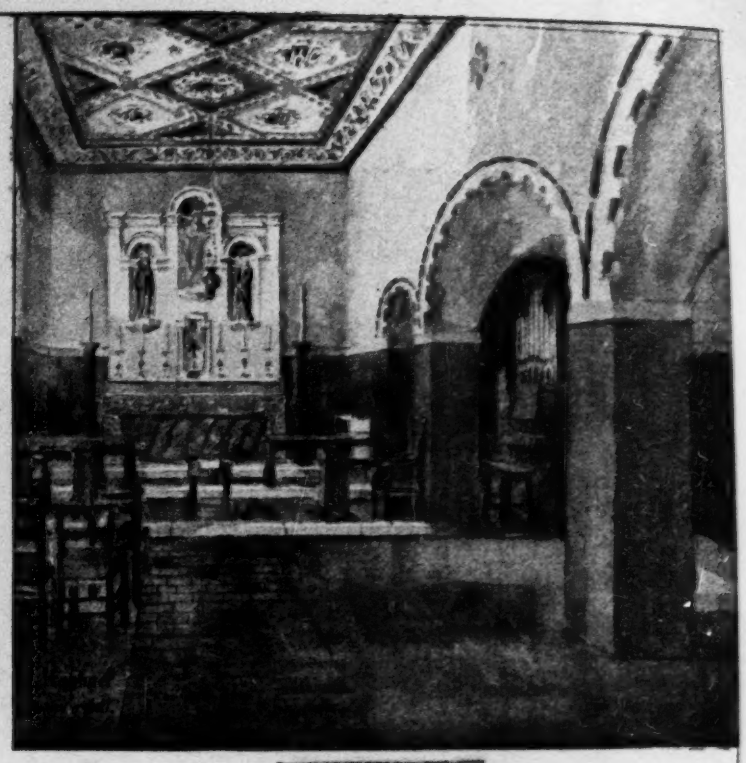


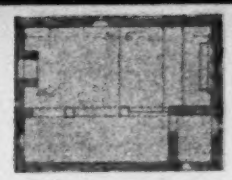


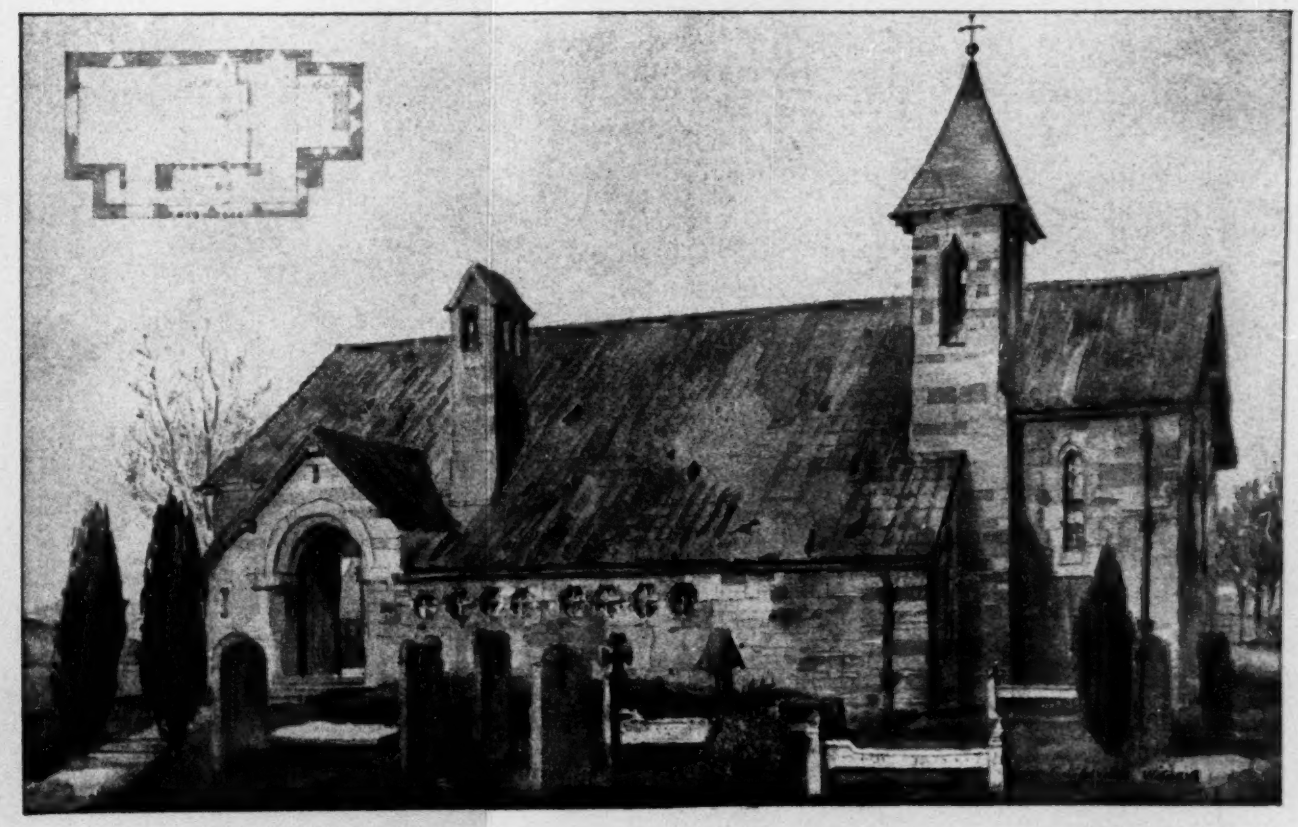




THREE CHAPEL







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'ELS.—Sir Charles A. Nicholson, Bart, F.R.I.B.A., Architect.

The Student's Column.

ROOFS: STRUCTURALLY CONSIDERED.—VIII.

15. *Miscellaneous Roof-covering Materials.*

IN this article will be found a series of notes upon various forms of roof-covering material less generally employed than those already mentioned but still of considerable value and fully deserving attention.

Asbestos-Cement.—This composition, consisting mainly of Portland cement and asbestos, is very hard and strong, is a good non-conductor of heat, an efficient fire-resisting material, and absorbs no more water than the best natural slate.

The following figures are taken from the results of tests made at the Austrian Royal Technical Institute upon a variety of the material made in Austria and sold in this country under the title of "Eternit" roofing slate:—

Tensile strength	2·58 tons per sq. in.
Compressive strength	3·70 " "
Coefficient of elasticity	2570 " "
Porosity	6·25 per cent.
Heat conductivity (Cork = 1)	13·9.

The weight of asbestos-cement slates is about 13 lb. per square foot 1 in. thick. This is rather more than the weight of earthenware tiles, but owing to the fact that the material is much thinner than tiles the weight of the roof-covering is correspondingly reduced.

Asbestos-cement slates are made in blue, grey, or red, and of the shapes and sizes shown in Fig. 68.

Patterns A and B are used for double-lap straight roofing, patterns C and D for single-lap diamond roofing, and patterns E and F for eaves.

Tables XVI. gives particulars of the two styles of roofing, and it will be seen that considerable economy can be affected by adopting the single-lap diamond system.

TABLE XVI.—ASBESTOS-CEMENT ROOFING SLATES ¼ IN. THICK PER SQUARE OF 100.

	System of Roofing.	
	Straight Double Lap.	Diamond Single Lap.
Lap	2½ in.	2½ in.
Battens	6½ in.	9 in.
Number of slates	150	92
Nails 1½ in.	320	190
Copper rivets	—	98
Total weight	3·35 cwt.	2·03 cwt.

Asbestos-cement slates are laid on battens, as illustrated in Fig. 69, which represents the diamond system of covering. As there shown the slates are fixed by nails and copper rivets, the latter being passed between the side corners of the slates and through holes in the top and bottom corners of the slates of each course. Fig. 70 indicates the positions of the triangular and oblong slates in the roof system.

Uralite is a preparation of asbestos manufactured in the form of tiles and sheets for roofing purposes. It is hard and tough, a good conductor of heat, and possesses high fire-resisting properties.

Uralite tiles are made in various sizes, of which particulars are given in Table XVII.

TABLE XVII.—URALITE TILES FOR "DIAMOND" ROOFING (¼ IN. THICK WITH 3-IN. LAP).

Size.	Gauge.	No. per Square.*	Weight per Square.*
15 in. × 15 in.	8½ in.	100	150 lb.
18 in. × 18 in.	5½ in.	64	135 lb.
21 in. × 21 in.	6 in.	45	130 lb.
24 in. × 24 in.	7½ in.	33	124 lb.
27 in. × 27 in.	8½ in.	25	120 lb.

* Exclusive of waste.

Fig. 71 represents the arrangement of diamond roofing, in which 15-in. square tiles are laid with a 3-in. lap.

As a general rule a 3-in. lap is sufficient for roofs of ordinary pitch, but a wider lap can be adopted in special cases if necessary. The tiles are fixed by 1¼-in. clout nails on 2-in. by ¾-in. battens.

Uralite tiles are also made in the sizes stated in Table XVIII. for ordinary roofing, with the lap of 2½ in., 3 in., or 3½ in.

TABLE XVIII.—URALITE TILES FOR "SQUARE" ROOFING (¼ IN. THICK).

Size.	Number and Weight per Square.					
	2½-in. Lap.			3-in. Lap.		
	Gauge.	Number.	Weight.	Gauge.	Number.	Weight.
16 in. × 9 in.	6½	258	242	6½	267	250
20 in. × 10 in.	8½	166	2·6	8½	171	223
24 in. × 12 in.	10½	122	229	10½	125	234

Fig. 72 illustrates the arrangement of uralite 20-in. by 10-in. tiles with a 3-in. lap.

For temporary buildings uralite sheeting is usually employed, being nailed upon close boarding, or upon rafters spaced 12 in. or 15 in. apart, centre to centre. The sheets are 3 ft. wide, and vary in length from 5 ft. to 6 ft. They are usually laid with a lap of 4 in., which is sufficient for roofs of ordinary pitch, and is equivalent to about 12½ per cent. of the area covered. All vertical joints are butted on the boarding or rafters, and covered with strips of uralite 3 in. wide, laid in 3-ft. courses with a 4-in. lap, these cover-strips being bedded in white or red lead and secured by copper or galvanised iron nails.

Fig. 73 illustrates the method of laying uralite in the manner described above.

Reinforced concrete is chiefly employed in covering flat roofs, which, from the structural standpoint, are not essentially different from floors. In buildings where reinforced concrete is the chief material of construction inclined roofs are covered by thin slabs of the same material built monolithic with the framework.

The surface of concrete roofs is frequently covered with asphalt as a precaution against the percolation of water.

As reinforced concrete is never employed in the form of separate slabs upon framework of a different material, it cannot appropriately be discussed as a covering material except in connexion with the other elements of roof construction.

The properties of reinforced concrete have been fully dealt with in a previous series of articles,* to which the reader is referred. The details of reinforced concrete roof construction will be illustrated by typical examples in a later article of the present series.

Terra-Cotta.—For flat and inclined roofs terra-cotta blocks are largely used in the United States.

Such blocks are generally made in three patterns:—

(a) *Book tiles*, having two segmental edges, giving the section the form of a book (see Fig. 74).

(b) *Plain roofing tiles* of rectangular section.

(c) *Rebated roofing tiles*, in the form of rectangular blocks, rebated at the bottom so as to provide for seating upon tee-bar supports (see Fig. 75).

Book tiles are usually of porous material, 10 in. to 12 in. wide, from 18 in. to 24 in. long, and varying in thickness from 2½ in. to 4 in. The average weight of book tiles 3 in. thick is about 12 lb. per square foot.

Plain roofing tiles vary from 8 in. to 12 in. wide, from 10 in. to 24 in. long, and from 1 in. to 4 in. thick. They are either of porous or of hard-burned terra-cotta. The average weight of plain roofing tiles 2 in. thick is about 12 lb. per square foot and 3 in. thick about 15 lb. per square foot.

Rebated roofing tiles are made both solid and hollow, and either of porous or of hard-burned terra-cotta. They are usually 12 in. wide, from 10 in. to 24 in. long, and from 2 in. to 4 in. thick. The average weight of rebated tiles 2 in. thick is 12 lb. per square foot, 3 in. thick 15 lb. per square foot, and 4 in. thick 20 lb. per square foot.

When used for flat roofs terra-cotta blocks are supported upon tee-bars, which may be spaced from 14½ in. to 20½ in. apart, centre to centre. Although making a neater job, rebated tiles are not so strong as plain tiles, and are considerably weaker than book tiles, which afford a certain amount of support alone the sides one to another.

In every case hollow tiles are stronger than the solid variety, and should be used in all positions except where the attachment of flashings makes solid blocks necessary.

Although affording adequate protection against external fire, a terra-cotta and tee-bar roof-covering gives no security against internal fire.

Terra-cotta tiles for inclined roofs should be of the rebated pattern where applied between purlins. As a general rule the terra-cotta work on inclined roofs is covered with slates, and, in consequence, porous material is preferable so as to provide a suitable nailing surface.

Shingles.—For sheds and temporary buildings of kindred character in positions where the risk of fire is not an important factor, timber boarding is sometimes used as a roof-covering. Timber, applied in the form of what may be termed "wooden tiles," is described as shingling. Pine, larch, oak, or any timber that can be split readily is used. The sizes of the shingles are about 5 in. wide by 9 in. long by 1 in. thick, tapering to a sharp edge in the case of pine, and about 6 in. wide by 12 in. to 18 in. long by ¼ in. thick for hard wood. Shingles are laid in horizontal courses, with a 4-in. or 5-in. gauge, nailed or pegged upon boards, and arranged so as to break joint. Oak shingles make a roof of artistic appearance, and have been largely used in church spires in some parts of England.

This form of roof-covering is very common in the United States. The subjoined table, from an American source, gives the number and weight of pine shingles per square of roof surface:—

Gauge.	No. per Square.	Weight per Square.	Remarks.
		lb.	
4	900	216	The number of shingles per square is for common gable roofs. For hip roofs add 5 per cent. The weights per square are based on the number per square.
4½	800	192	
5	720	173	
5½	655	157	
6	600	144	

Thatch.—This material is obviously only permissible in districts where stringent building regulations are not in force, and is quite unsuitable in towns. Even in country districts thatch is not a particularly economical material in the present day owing to the increased value of straw, but it can often be used with good effect and advantage for covering small buildings when economy is a secondary consideration.

The advantages and disadvantages of thatch may be briefly stated as follows:—

Advantages.—Picturesque appearance, lightness, warmth in winter, coolness in summer. Owing to the two latter characteristics thatched roofing is specially suitable for ice-houses and dairies.

Disadvantages.—Risk of fire, particularly in new roofs, extra cost of fire insurance, harbourage for birds, insects, and vermin, risk of injury by cattle.

The weight of straw required per square of thatching is about 5 cwt., but the weight per square is far more, according to the amount of water absorbed. The best pitch for a thatched roof is 45 deg.; if less rain will not run off freely, and if more the straw is apt to slip from its fastenings.

Wire-Wove Roofing.—This consists of fine wire-netting treated with a transparent substance so as to fill up the meshes. The material is elastic, strong, and waterproof. It is made in sheets 32 in. by 32 in. and up to 102 in. long by 26 in. wide. It is a suitable covering material for temporary buildings where ample interior light is a desideratum.

Willesden Paper.—This is a strong, durable, and waterproof material for light roofs.

* *The Builder*, Vol. LXXXV.

It is a variety of cardboard treated with cuprammonium solution, the effect of which is to impregnate the paper with cuprocellulose, a substance which not only enables it to resist the weather but cements the fibres together, and so considerably increases their resistance to mechanical forces and to fire.

Willesden paper is made in various thicknesses, described as 1-ply, 2-ply, and 4-ply. The last-mentioned is the only variety that should be used as a roof-covering, the others being employed respectively for lining walls and underlining slates or tiles.

The 4-ply paper is supplied in rolls 19 in. to 60 in. wide, brown or neutral green in colour.

Willesden paper is fixed in a manner generally similar to that adopted for roofing-felt and other material supplied in the form of sheets. The following statement gives the relative covering capacity of this material and galvanised iron of average gauge:—

	Weight per Square.		Area Covered per Ton.
Willesden paper ...	15-18 lb.	...	125-150 sq. ft.
Galvanised iron ...	103-280 lb.	...	8-22 sq. ft.

Galvanised Iron Tiles.—Fig. 76 illustrates a form of stamped galvanised iron tile for roofing purposes made in No. 24, No. 26,

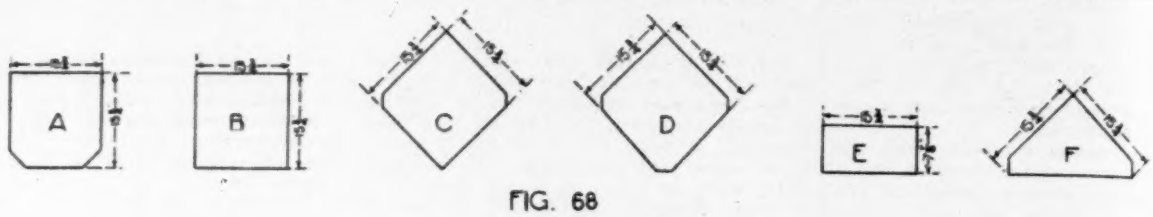

FIG. 68

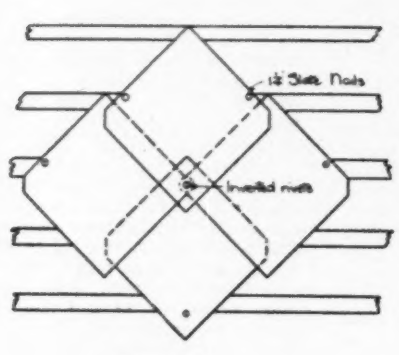

FIG. 69

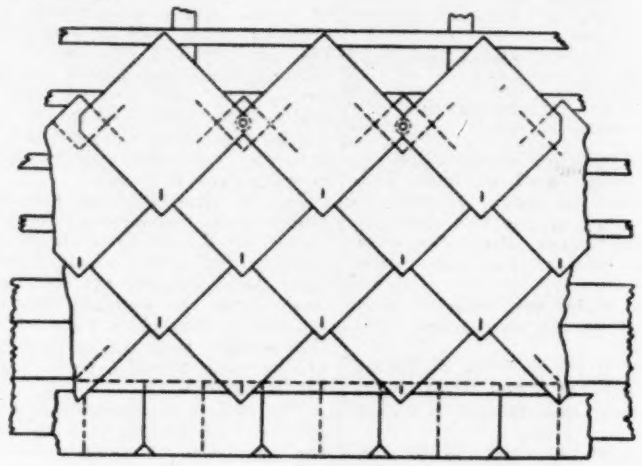
FIG 70

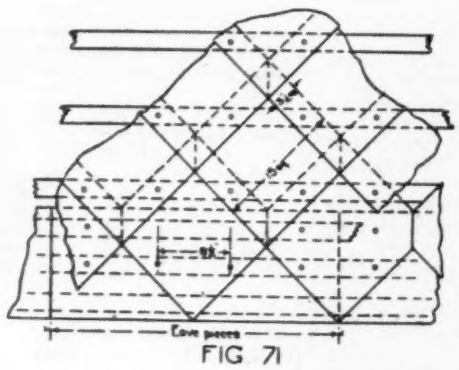

FIG 71

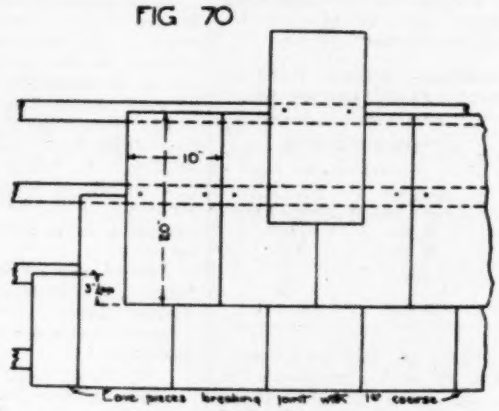

FIG. 72

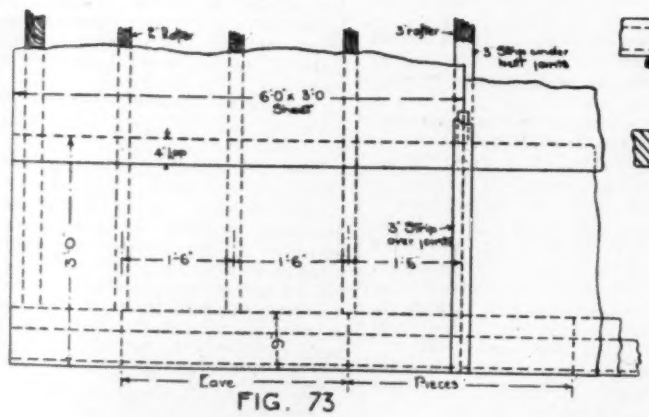

FIG. 73

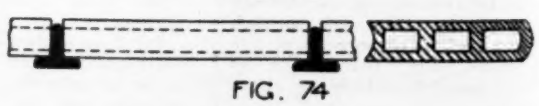
FIG. 74

FIG. 75

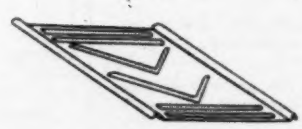
FIG 76

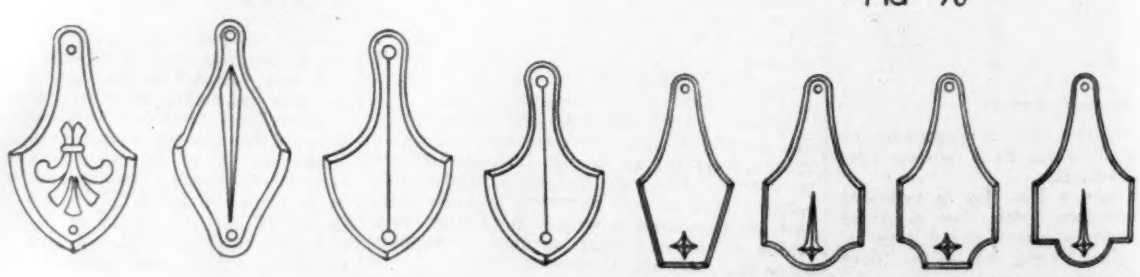
FIG. 77

Illustrations to Student's Column.

and No. 28 gauges, and measuring 3 ft. by 1 ft. 9½ in., centre to centre of flutes, or 1 ft. 11 in. overall.

Zinc and Copper Tiles.—Fig. 77 illustrates various patterns of ornamental embossed tiles, in zinc and copper, which can be used with more or less artistic effect in covering the roofs of towers, mansards, domes, and other architectural features. The maximum dimensions of the tiles are about 20 in. long by 10 in. wide overall.

Owing to their form a very small lap is required, the tiles being fixed by nails through the holes provided at the top and bottom, as shown in the drawings.

Hips, finials, aprons, and lunettes of embossed zinc and copper are supplied of suitable character for each tile design.

General Building News.

ROMAN CATHOLIC CHURCH, BALLYMAHON.—On the 26th ult. the opening of the new church of St. Matthew took place at Ballymahon. The new building, from the back of the chancel to the front wall, measures 120 ft. In width it is 80 ft. across the transepts, and 30 ft. in the nave. The tower in the south-west front is 110 ft. from the ground. The church, which was designed by Mr. T. F. M'Namara, of Dublin, is built of grey hammered stone, and faced with white cut-stone from Ross, Tullamore, and Newtowncashel. The roof is supported by seven moulded and wrought pitch-pine principals in carved models. The work has been carried out by Mr. Patrick Kelly, of Longford.

WESLEYAN CHURCH, ABERTILLERY.—The foundation-stones of the new Wesleyan church at Abertillery were laid recently. The new building will be built of Forest stone. The principal features are a tower at the corner of the building, and a large traceried window facing the main street. The church inside will have galleries all round, and an organ-chamber on one side in the form of a transept. The roof will be an open-timber one, supported on columns, and lined with match-boarding. The seats, rostrum, and other joinery will be of pitch-pine. The plans have been prepared by Messrs. Habershon, Fawckner & Co., Newport and Cardiff; and the contractor is Mr. Charles Shopland, Newport. The estimated cost is 5,000*l.*, and the accommodation will be for 750.

CHURCH RESTORATION, BRYNCROES, SOUTH CARNARVONSHIRE.—The parish Church of St. Mary, Bryncroes, South Carnarvonshire, has undergone a thorough restoration, and was recently reopened by the Lord Bishop of Bangor. The works have been carried out by Mr. Robert Jones, contractor, of Bronphillip, Bottunog, from designs and under the supervision of Mr. Harold Hughes, architect, of Bangor.

BAPTIST CHAPEL, BARGOED.—A new chapel has been erected, at a cost of between 3,000*l.* and 4,000*l.*, for the English Baptists at Bargoed. There is seating accommodation for over 1,200. The architects were Messrs. James & Morgan, Cardiff; the contractor, Mr. R. Burns; and the decorations have been carried out by Mr. I. Guppy.

SCHOOLS, TWICKENHAM.—The new schools in Trafalgar-road, the first to be erected by the local education authority in the parish of Twickenham, were opened a short time ago. They provide seven classrooms for infants, capable of holding 390, a spacious corridor, head mistress's-room, and store-room, with hat and cloak room. The girls' classrooms also number seven, capable of holding 380, with part use of the central hall for drilling, head mistress's-room, and store-room, and a large cookery classroom (with fifty-four places), fitted with kitchener and gas cooker. In the joint playground for girls and infants, there was a fountain for drinking water. The boys' department consisted of seven classrooms, capable of holding 380, with part use of the central hall on wet days for drilling, head master's-room, and store-room, and a drinking fountain in the playground. In all there are 1,150 places (not including the cookery classroom), and the tenders for the buildings with out-buildings, sanitary work, water supply, electric lighting, exhaust fans, etc., ranged from 17,000*l.* down to 13,346*l.* The equipment consists of oak-polished desks, cupboards, furniture, and fittins, amounted to 1,685*l.* The builders were Messrs. Patrick. Mr. Jefferys carried out the heating and ventilation, and the equipment was done by the Bennet Furnishing Company. Mr. H. A. Cheers, of Twickenham, was the architect.

GRAMMAR SCHOOL, NEWCASTLE.—The erection of the new grammar school at Newcastle is now approaching completion. Mr. J. Holden is acting for Messrs. Russell & Cooper, London, the architects of the work. The chief contract has been carried out by Messrs. Harold & Sons, Doncaster, who have been represented by Mr. W. Smith. The floors are laid with Canadian maple blocks, laid by Messrs. J. B. Burgess & Co., Liverpool. The sanitary fittings are by Mr. Geo. Jennings, London; the electrical wiring has been done by Messrs. Wenham & Waters, Ltd., Croydon; the heating and ventilation apparatus has been supplied by Messrs. Henry Hope & Sons, Ltd., Birmingham; and Mr. Robt. A. Smith, M.Inst.E.E., London, has acted as consulting electrical engineer.

WESLEYAN SUNDAY-SCHOOL AND CHURCH ENLARGEMENT, EASTLEIGH.—The foundation-stones were recently laid in connexion with the Wesleyan new Sunday-school and church enlargement scheme. The scheme consists of the enlargement of the present church to afford accommodation for fifty extra sittings, in addition to providing an organ-chamber and choir, etc. The cost is about 2,500*l.* The builders engaged upon the work are Messrs. Golding & Ansell, and the architects Messrs. John Wills & Sons, of Derby.

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It is a variety of cardboard treated with cuprammonium solution, the effect of which is to impregnate the paper with cuprocellulose, a substance which not only enables it to resist the weather but cements the fibres together, and so considerably increases their resistance to mechanical forces and to fire.

Willesden paper is made in various thicknesses, described as 1-ply, 2-ply, and 4-ply. The last-mentioned is the only variety that should be used as a roof-covering, the others being employed respectively for lining walls and underlining slates or tiles.

The 4-ply paper is supplied in rolls 19 in. to 60 in. wide, brown or neutral green in colour.

Willesden paper is fixed in a manner generally similar to that adopted for roofing-felt and other material supplied in the form of sheets. The following statement gives the relative covering capacity of this material and galvanised iron of average gauge :—

	Weight per Square.		Area Covered, per Ton.
Willesden paper ...	15-18 lb.	...	125-150 sq. ft.
Galvanised iron ...	103-280 lb.	...	8-22 sq. ft.

Galvanised Iron Tiles.—Fig. 76 illustrates a form of stamped galvanised iron tile for roofing purposes made in No. 24, No. 26,

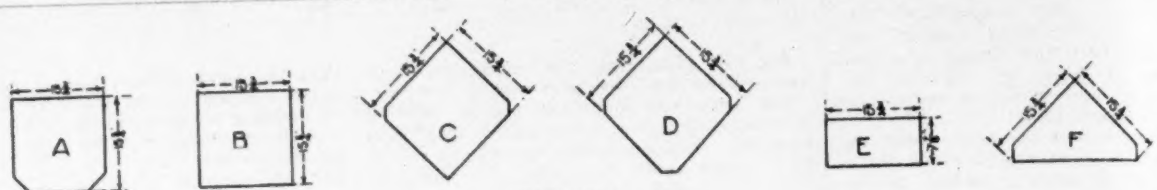

FIG. 68

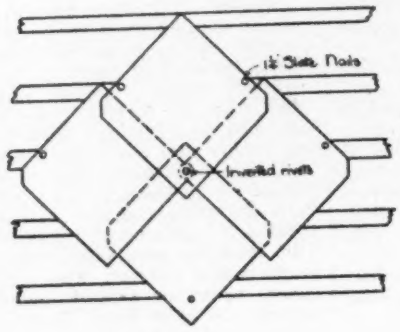

FIG. 69

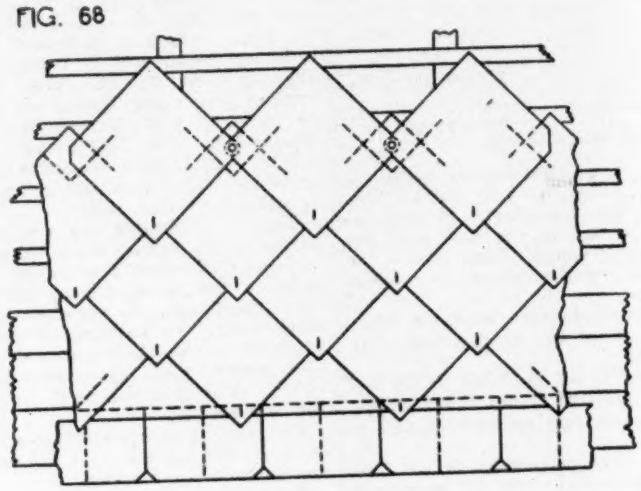

FIG 70

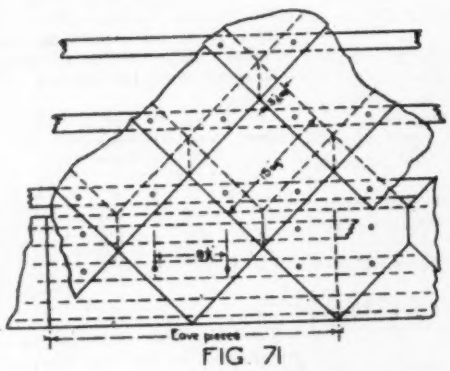

FIG. 71

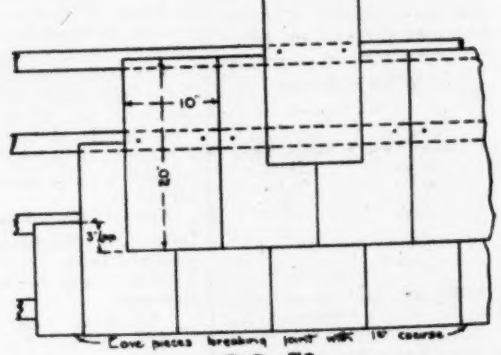

FIG. 72

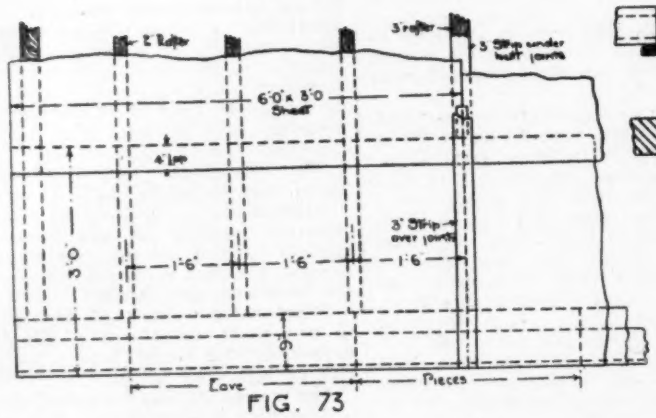

FIG. 73

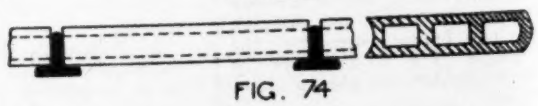

FIG. 74

FIG. 75

FIG 76

FIG. 77

Illustrations to Student's Column.

and No. 28 gauges, and measuring 3 ft. by 1 ft. 9½ in., centre to centre of flutes, or 1 ft. 11 in. overall.

Zinc and Copper Tiles.—Fig. 77 illustrates various patterns of ornamental embossed tiles, in zinc and copper, which can be used with more or less artistic effect in covering the roofs of towers, mansards, domes, and other architectural features. The maximum dimensions of the tiles are about 20 in. long by 10 in. wide overall.

Owing to their form a very small lap is required, the tiles being fixed by nails through the holes provided at the top and bottom, as shown in the drawings.

Hips, finials, aprons, and lunettes of embossed zinc and copper are supplied of suitable character for each tile design.

General Building News.

ROMAN CATHOLIC CHURCH, BALLYMAHON.—On the 26th ult. the opening of the new church of St. Matthew took place at Ballymahon. The new building, from the back of the chancel to the front wall, measures 120 ft. In width it is 80 ft. across the transepts, and 30 ft. in the nave. The tower in the south-west front is 110 ft. from the ground. The church, which was designed by Mr. T. F. M'Namara, of Dublin, is built of grey hammered stone, and faced with white cut-stone from Ross, Tullamore, and Newtowncashel. The roof is supported by seven moulded and wrought pitch-pine principals in carved models. The work has been carried out by Mr. Patrick Kelly, of Longford.

WESLEYAN CHURCH, ABERTILLERY.—The foundation-stones of the new Wesleyan church at Abertillery were laid recently. The new building will be built of Forest stone. The principal features are a tower at the corner of the building, and a large traceried window facing the main street. The church inside will have galleries all round, and an organ-chamber on one side in the form of a transept. The roof will be an open-timber one, supported on columns, and lined with match-boarding. The seats, rostrum, and other joinery will be of pitch-pine. The plans have been prepared by Messrs. Habershon, Fawckner & Co., Newport and Cardiff; and the contractor is Mr. Charles Shopland, Newport. The estimated cost is 5,000*l.*, and the accommodation will be for 750.

CHURCH RESTORATION, BRYNCROES, SOUTH CARNARVONSHIRE.—The parish Church of St. Mary, Bryncroes, South Carnarvonshire, has undergone a thorough restoration, and was recently reopened by the Lord Bishop of Bangor. The works have been carried out by Mr. Robert Jones, contractor, of Bronphillip, Bottunog, from designs and under the supervision of Mr. Harold Hughes, architect, of Bangor.

BAPTIST CHAPEL, BARGOED.—A new chapel has been erected, at a cost of between 3,000*l.* and 4,000*l.*, for the English Baptists at Bargoed. There is seating accommodation for over 1,200. The architects were Messrs. James & Morgan, Cardiff; the contractor, Mr. R. Burns; and the decorations have been carried out by Mr. I. Guppy.

SCHOOLS, TWICKENHAM.—The new schools in Trafalgar-road, the first to be erected by the local education authority in the parish of Twickenham, were opened a short time ago. They provide seven classrooms for infants, capable of holding 399, a spacious corridor, head mistress's-room, and store-room, with hat and cloak room. The girls' classrooms also number seven, capable of holding 380, with part use of the central hall for drilling, head mistress's-room, and store-room, and a large cookery classroom (with fifty-four places), fitted with kitchener and gas cooker. In the joint playground for girls and infants, there was a fountain for drinking water. The boys' department consisted of seven classrooms, capable of holding 380, with part use of the central hall on wet days for drilling, head master's-room, and store-room, and a drinking fountain in the playground. In all there are 1,150 places (not including the cookery classroom), and the tenders for the buildings with out-buildings, sanitary work, water supply, electric lighting, exhaust fans, etc., ranged from 17,000*l.* down to 13,340*l.* The equipment consists of oak-polished desks, cupboards, furniture, and fittins, amounted to 1,685*l.* The builders were Messrs. Patrick. Mr. Jefferys carried out the heating and ventilation, and the equipment was done by the Bennet Furnishing Company. Mr. H. A. Cheers, of Twickenham, was the architect.

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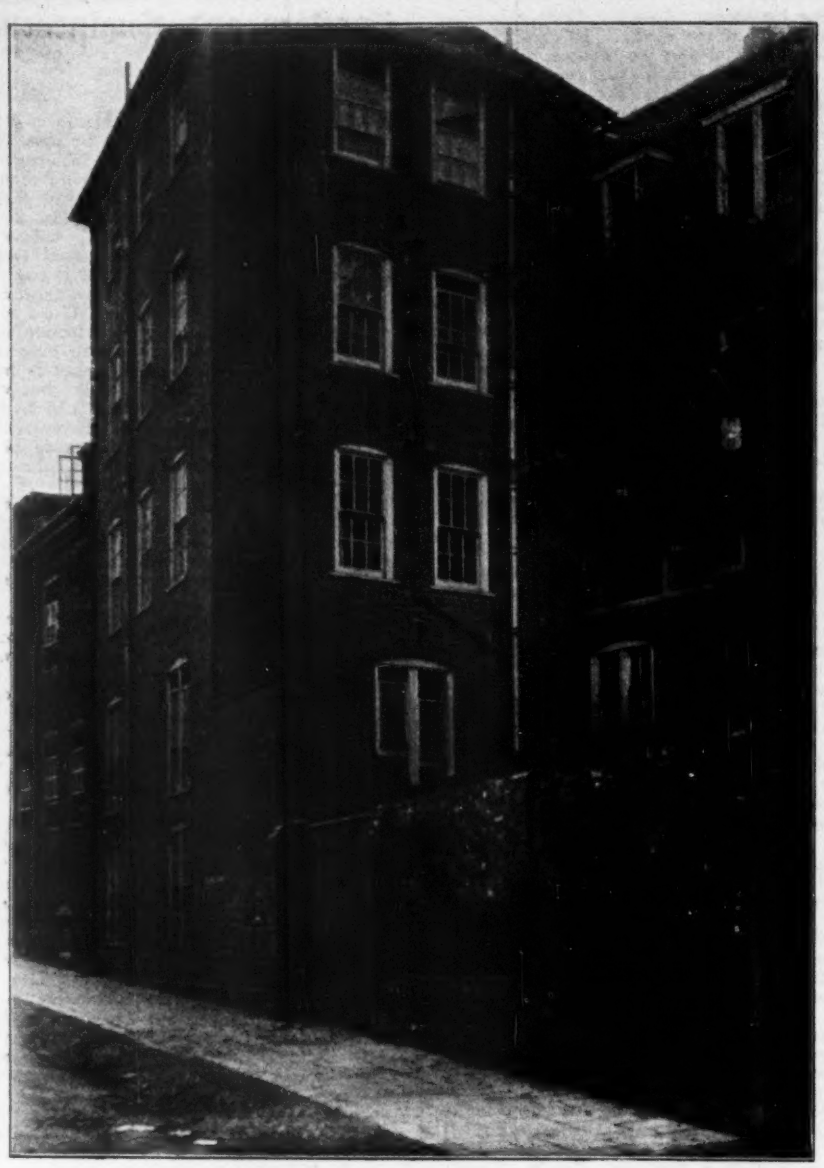

A Curious Piece of Sanitation.

branch B1, so that some portion of each discharge from the latter must enter A2 and pass into the lower branch B2 inside the building, and probably into the trap of the fitting to which B2 is connected. This is an error of such an astounding character that, without the evidence of the photograph, its commission in a new building would hardly be credited. The hopper-heads and waste-pipes, marked C, are not what one would expect to find in a building of this class, but in comparison with the soil-pipe connexions they are innocuous.

Foreign.

TORONTO.—The Report of the proceeding of the Ontario Association of Architects shows that there is a considerable movement in favour of the improvement and embellishment of Toronto. There is a wide extent of sea front (or lake front) at Toronto, which is in itself an advantageous circumstance for schemes of city improvement. The paper on the subject, read by Mr. Langton, proposes three main lines of improvement: (1) The treatment of the water front; (2) the provision of a surrounding line of parks or park-ways; (3) formation of new direct lines of traffic. For this latter he seems to recommend the now favourite system of running diagonal streets through the existing parallel blocks; a system which is no doubt advantageous as to communication, but (as we recently pointed out) inconvenient in regard to the provision of building sites, leading to a number of awkward corners, difficult to deal with satisfactorily either in regard to the plan or the architectural exterior of buildings. The result of the diagonal streets, however, Mr. Langton thinks, will be to give character to Toronto. The following is the conclusion of his paper on the subject:—

"When we leave Toronto, as the Scotchman leaves Edinburgh, can we look back to old Toronto as he looks back to 'Auld Reekie?' I am afraid not. The reason is that Edinburgh has character; it is called the modern Athens I suppose because of its hill. We have none of those natural advantages in Toronto; we have to make them. I do not say we have no advantages, but they are not of such a salient character that you cannot snow them under with cheap houses. There is not anything that we cannot spoil in Toronto. But if we will preserve it and make it a town of some character then we shall feel when we come back as I heard a man on an ocean vessel say he felt in going back to Boston. He said he had seen nothing in his travels that he liked so well as the golden dome of the State House on Beacon Hill. That one can believe. Beacon Hill and Boston have something to which one can attach himself; something to make a man say, 'This is my town; I was born in Boston.' Oliver Wendell Holmes makes one of his characters say, 'I am a Boston boy.' That cannot be said of any town that has not got a strong and definite character. In Toronto that character must be made by planning."

BRUSSELS.—The fourth international congress on the comparative resistance of building materials opened on the 3rd inst. at the Palais des Académies, in the presence of the Belgian Premier, Count de Smet de Naeyer, and over 600 delegates from various countries. The Presidential chair was occupied by M. Berger, Director of Public Buildings in Vienna. The object of the conference is to study the comparative merits of building material, notably of steel and cement.—*Times.*

SOUTH AFRICA.—Recent acceptances of building contracts include the following:—That of Mr. J. M. Coall, for the erection of police barracks and stalls at Roodepoort, Transvaal, at a cost of 8,025*l.*; that of Messrs. Lane & Brannif, for alterations in the western wing of the new Government buildings, Pretoria, at a cost of 2,000*l.*; that of Messrs. McChlery & Band, for the erection of a post-office at Benoni, at a cost of 1,720*l.*; and that of Mr. J. Richards, for making approaches to the Rebecca-street (Pretoria) Bridge, at a cost of 3,500*l.*——Tenders are invited for the following:—For the erection of market offices at Kimberley; for new Government schools at Thaba 'Nchu and Vredefort; for bridges at Blesbok, Knight's Spruit, Klip River, Heidelberg, Elsburg, and Vereeniging.——Lord Selborne's new residence in Pretoria is nearly ready for occupation. The architecture is an adaptation of the old Cape Dutch style. The builders were Messrs. Edmanson & Thomas, of Johannesburg, the architect being Mr. Herbert Baker, formerly of London.——The *East African Standard*, of Mombasa, notes the arrival there of Mr. Rand Overy, architect, and expresses the hope that citizens who are proposing to build will take advantage of this opportunity of consulting Mr. Overy, adding, "Really, the architecture of Mombasa needs a little improvement."

Miscellaneous.

NATIVE HANDICRAFTS IN AUSTRIA.—The Austrian Government Service for the Promotion of Handicrafts has recently held an Exhibition in Vienna with the object of helping those who are employed in limited industries in the remote portions of the Empire. Some model workshops were fitted at the Central Institution with modern plant for wood-working, together with a smith's shop, as exemplars to replace antiquated methods; grants in aid are offered to those who will go to Vienna and attend courses of practical instruction, and travelling teachers are sent into the villages to give lectures, with demonstrations, upon the uses of improved hand and machine tools, and upon the more advanced processes of manufacture. The cutlers and smiths of Lower Austria and the Tyrol, for instance, will, it is anticipated, greatly benefit through the display of more modern appliances and materials for tempering and annealing operations. A visit to the arts and crafts side of the Exhibition at Earl's-court will demonstrate what good results have already followed the formation in Austria of some 200 co-operative associations, to foster the existence of the smaller local industries and to develop the manual skill and taste in design of the individual craftsman.

GARDEN CITY, LETCHWORTH.—The Company known as "First Garden City, Ltd.," have issued a guide to the Garden City at Letchworth, which forms a kind of history of the formation of the Garden City and a summary of its attractions, present and possible. The guide is compiled by Mr. Thomas Adams, the Secretary to the Company, and contains a great deal of information, with illustrations and plans, for the small sum of 2d. It is published by the Company at their offices.

COTTAGE MODELS AND DESIGNS COMPETITION, BREDON'S NORTON.—In the prize competition for Cottage Models and Designs, which were on view at the recent Agricultural Show at Bredon's Norton, the assessor, Mr. C. E. Bateman, F.R.I.B.A., of Birmingham, awarded the prizes as follows:—*For designs illustrated by models*—First prize, 15*l.*, to "Cryptonian" (Mr. Henry Weaver, Gloucester); second prize, 10*l.*, to "Pro Bono Publico" (Messrs. Hugo Bird and Robert Browne, Brentwood). *For designs illustrated by drawings only*—First prize, 10*l.*, to "Red Lion" (Mr. A. Dennis-Thacker, Birmingham); second prize, 7*l.*, to "Holte" (Messrs. Sam Cooke and Norman Twist, Birmingham). Mr. Bateman considered that the competition had produced some good designs; the work of "Red Lion" he commended especially, because it indicated a character of work more in harmony with the country and the old buildings of the district than any of the others; he further considered that these designs would carry on the old traditions of Cotswold buildings.

A DISCLAIMER.—Messrs. A. White & Co., builders and contractors, of 82, Paradise-street, Rotherhithe, ask us to state, to prevent a misconception, that they have no connexion with any other firm of builders of the same name.

STANDARD NUTS, BOLT-HEADS, AND SPANNERS.—Early in 1905 the disparity in the sizes of lock-nuts manufactured in this country was brought before the main body of the Engineering Standards Committee, and, as the result of discussion, it was decided to refer the matter to the Sectional Committee on Screw Threads and Limit Gauges, of which Mr. H. F. Donaldson is Chairman. Upon the collection of particulars from manufacturers it became evident that recommendations might usefully be made not only with regard to lock-nuts, but also with reference to ordinary nuts, bolt-heads, and spanners. The upshot is the Report now published, wherein particulars are given of British standard nuts, lock-nuts, bolt-heads, spanners, and "castle" nuts. As these recommendations are directly calculated to promote interchangeability it is to be hoped that they will be generally accepted, an end which architects and consulting engineers can do much to forward by the insertion of suitable demands in their specifications.

AUCTIONEERS' INSTITUTE.—The autumn provincial meeting of the Auctioneers' Institute will be held at Windsor on September 12—15, under the presidency of Mr. H. D. Buckland who practises in Windsor. The proceedings will comprise a mayoral reception and a luncheon at the

Town Hall on September 13, a council meeting, and a banquet. The King has granted this permission to the members to visit the Royal Gardens and Farm, the State apartments, and portions of the Castle which are not usually opened to the public.

ROCHESTER CATHEDRAL.—The Dean Hole memorial, erected in the south end of the south transept, will be unveiled and dedicated on September 29. The effigy of the late Dean, sculptured in marble, is the work of Mr. F. W. Pomeroy, A.R.A., the altar tomb, of alabaster, has been designed by Mr. C. Hodgson Fowler, architect to the Dean and Chapter.

WILBERFORCE MUSEUM, HULL.—The Elizabethan house in High-street, Hull, wherein William Wilberforce was born on August 24, 1759, has been purchased by the Corporation for the purposes of a museum to illustrate the domestic and commercial history of the Borough. The house has been restored to its pristine state, and was opened a few days ago. Some portraits of Wilberforce, with many objects which belonged to him or his family, have been presented to the museum.

WIDENING OF HAMPSTEAD-ROAD.—A prolonged negotiation for the acquisition of the site of the old King's Head Tavern at the corner, east, of Hampstead and Euston roads, is now concluded. The London County Council have agreed to pay 18,000*l.* to the Metropolitan Railway Company as owners of the freehold, and 29,200*l.* for the leasehold and trade interests in the property. The two claims made at the outset amounted to 71,000*l.*

WALL-PAINTINGS, WESTMINSTER PALACE.—A Parliamentary paper has been issued and embodies Professor Church's memorandum, the eighth of a series, upon the condition and treatment of the five wall-paintings executed by W. Dyce, R.A., in 1851-64, in the King's Robing-room, with a detailed description of the repairs and repainting executed in 1904-5, under his directions, and mainly by Mr. Redhead, of the firm of Messrs. Shrigley & Hunt, of Lancaster, who dealt also with Maclise's water-glass painting, "Wellington," on the south wall of the Royal Gallery. Professor Church, who has devoted much time and labour quite gratuitously to the task, concludes his report thus :—

> The advisability of cleaning and repairing these and the other wall-paintings . . . at intervals of three or four years has become more evident to me. . . . The increased and increasing consumption of coal in London, and the greater licence allowed to the gas companies in the matter of freeing their gas from sulphur compounds must result in a serious augmentation of the amount of sulphuric acid in the air of the Metropolis. This acid it is which constitutes the chief destructive agency at work on pictorial and other artistic productions.

Professor Church recommends that the frescoes in the House of Peers should be again cleaned and repaired during the current year under his guidance, ten years having elapsed since they were treated. The Office of Works have made arrangements accordingly in respect of the frescoes under glass in the Peers' and the Commons' corridors.

WAR MEMORIAL, NORTHWICH.—A memorial tablet has been placed in the Northwich Parish Church in memory of the men of the district who fell in South Africa. The tablet, which is of bronze, has been designed and executed by Messrs. George Wragge, Ltd., of the Wardry Works, Salford.

NATIONAL ART MUSEUM, SOUTH KENSINGTON.—We have received a catalogue (364 pages small 8vo) of the modern etchings and aquatints of the British and American schools which are in the National Art Library at the Victoria and Albert Museum. They are grouped under the names of artists, arranged alphabetically, and show what a large and valuable collection of etchings and prints is to be found in the museum.

CHURCH OF ST. STEPHEN, THE GREEN, HAMPSTEAD.—It is stated that the west front of the church has sunk by several inches, and is being under-pinned. The church was built for 1,200 sittings, at a cost of some 27,000*l.*, in 1868-9, after plans and designs in the Moorish-Gothic style by S. S. Teulon.

Legal.

ACTION AGAINST THE DONCASTER CORPORATION.

THE case of Palmer *v.* the Corporation of Doncaster came before Mr. Justice Sutton, in the Vacation Court, on the 5th inst., on a motion by the plaintiff for an interlocutory injunction to restrain the defendants, until the trial of the further order, from erecting a urinal at the junction of the old Roman road and the Great North road at Doncaster.

In the result, his lordship granted an injunction over Tuesday next, when the motion will be heard in Chambers.

Patents of the Week.

APPLICATIONS PUBLISHED.*

16,766 of 1905.—R. PANSIN: *Locks.*

This consists in the combination of a lock proper with an auxiliary lock, having a barrel for the insertion of the key, and a number of tumblers presenting teeth adapted to enter the key-slot of such barrel on this being turned by a skeleton key, the said barrel having transverse grooves receiving some of the said tumblers, while the remaining ones lie against the ribs formed between the said grooves.

26,389 of 1905.—J. BOARD & Co., LTD., and W. S. AKERMAN: *Roofing and other Tiles.*

This relates to an interlocking tile for roofing and other purposes, having on its upper face two ridges, and on its lower face three ridges, the ridges on the upper face of each tile being designed to engage with two ridges or surfaces on the underside of the superposed tile, and being so aranged that the tile can be produced by a machine die.

2,305 of 1906.—W. C. FAIRWEATHER (G. Niemeyer): *Sash Windows.*

This relates to a sash window which is capable of movement in its own plane and have independent movement in a plane at an angle thereto, and wherein the pane is caused to move parallel to its plane by means of lateral rails having wedge projections which engage with slots in racks, and consists in the arrangement whereby the pane is guided directly between longitudinal grooves in the side rails and is itself pressed against a packing surface without the need of a frame to enclose it.

4,215 of 1906.—W. H. TAYLOR: *Latch Locks.*

This relates to a latch lock having a spring-actuated latch and a dead-locking slide mounted to move in a direction at right angles to the movement of said latch, and consists in the employment of a pivoted cam adapted to be actuated by a key from the outside for retracting the latch, and of means actuated by said cam for moving the dead-locking slide into and out of the latch.

12,402 of 1906.—H. MOOSHAKE: *Extrusion Presses for Making Hollow Bricks, or the like.*

This relates to an extrusion press for manufacturing hollow bricks, artificial stones, or the like, and consists of means for conveying water to lubricate the cores, said means comprising supply pipes supported by bridges, and provided with openings adapted to convey the water to channels in the core from which the water passes through openings formed between the overlapping ends of the jacketing plates of the core to a hole formed in the brick, or the like.

TO CORRESPONDENTS.

NOTE.—The responsibility of signed articles, letters, and papers read at meetings rests, of course, with the authors.

We cannot undertake to return rejected communications; and the Editor cannot be responsible for drawings, photographs, manuscripts, or other documents, or for models or samples, sent to or left at this office, unless he has specially asked for them.

Letters or communications (beyond mere news items) which have been duplicated for other journals are NOT DESIRED.

All communications must be authenticated by the name and address of the sender whether for publication or not. No notice can be taken of anonymous communications.

We are compelled to decline pointing out books and giving addresses.

Any commission to a contributor to write an article, or to execute or lend a drawing for publication, is given subject to the approval of the article or drawing, when received, by the Editor, who retains the right to reject it if unsatisfactory. The receipt by the author of a proof of an article in type does not necessarily imply its acceptance. The Editor cannot undertake to read and consider articles offered for acceptance unless they are type-written.

All communications regarding literary and artistic matters should be addressed to THE EDITOR; those relating to advertisements and other exclusively business matters should be addressed to THE PUBLISHER, and not to the Editor.

SOME RECENT SALES OF PROPERTY:

ESTATE EXCHANGE REPORT.

Aug. 22.—By A. & D. EDWARDS (at Hereford).
Munsley, Hereford.—Paunceford Court Farm, 276 acres, f. **£6,000**

By A. GODWIN PRATT (at Parkstone).
Parkstone, Dorset. — Windsor-rd., f.g. rents 23*l.* 2s., reversion in 980 yrs. **619**

Aug. 27.—By DOLMAN & PEARCE (at Camden Town).
Hampstead.—48, Maitland Park-rd., u.t. 45 yrs., g.r. etc., 7*l.* 15s., y.r. 40*l.* **400**

* All these applications are in the stage in which opposition to the grant of Patents upon them can be made.

By NORMAN & SON (at Stratford).
Leytonstone.—67, 69, and 71, Crownfield-rd. (s.), u.t. 69 yrs., g.r. 11*l.* 3s. 6d., y.r. 89*l.* 2s. £670

Aug. 28.—By MAY & PHILPOT.
Brixton.—6 and 8, Jelf-rd., u.t. 66 yrs., g.r. 13*l.*, w.r. 85*l.* 16s. 580

By R. DONKIN & SON (at Newcastle).
Ingram, Northumberland.—Greenside Hill and Hartside Farms, 2,051 acres, f., y.r. 605*l.*... 17,000

By THORNBORROW & Co. (at Penrith).
Penrith, Cumberland. — Freehold enclosure, 3 a. 3 r. 9 p. 455

Aug. 29.—By T. F. DEASON.
Harlesden.—4, Queen's-rd. (s.), u.t. 85 yrs., g.r. 5*l.*, y.r. 36*l.* 200

Contractions used in these lists.—F.g.r. for freehold ground-rent; l.g.r. for leasehold ground-rent; i.g.r. for improved ground-rent; g.r. for ground-rent; r. for rent; f. for freehold; c. for copyhold; l. for leasehold; p. for possession; e.r. for estimated rental; w.r. for weekly rental; q.r. for quarterly rental; y.r. for yearly rental; u.t. for unexpired term; p.a. for per annum; yrs. for years; la. for lane; st. for street; rd. for road; sq. for square; pl. for place; ter. for terrace; cres. for crescent; av. for avenue; gdns. for gardens; yd. for yard; gr. for grove; b.h. beerhouse; p.h. for public-house; o. for office; s. for shops; ct. for court.

MEETINGS.

MONDAY, SEPTEMBER 10.

Royal Sanitary Institute (Lectures for Sanitary Officers).—Dr. J. Priestley on "Sanitary Law." I. 7 p.m.

Clerks of Works Association (Carpenters' Hall).—Paper by Mr. J. Redden. 7.30.

WEDNESDAY, SEPTEMBER 12.

Royal Sanitary Institute (Lectures for Sanitary Officers).—Dr. J. Priestley on "Sanitary Law." II. 7 p.m.

FRIDAY, SEPTEMBER 14.

Royal Sanitary Institute (Lectures for Sanitary Officers).—Dr. J. Priestley on "Sanitary Law." III. 7 p.m.

SATURDAY, SEPTEMBER 15.

Architectural Association. — Week-end visit to Chichester.

PRICES CURRENT OF MATERIALS.

*** Our aim in this list is to give, as far as possible, the *average* prices of materials, not necessarily the lowest. Quality and quantity obviously affect prices—a fact which should be remembered by those who make use of this information.

BRICKS, &c.

	£	s.	d.			
Hard Stocks	1	10	0	per 1000 alongside, in river		
Rough Stocks and Grizzles	1	7	0	"	"	"
Picked Stocks for Facings	2	17	6	"		delivered.
Flettons	1	8	0	"	at railway depôt.	
Red Wire Cuts	1	14	0	"	"	"
Best Fareham Red	3	12	0	"	"	"
Best Red Pressed Ruabon Facing	5	0	0	"	"	"
Best Blue Pressed Staffordshire	3	15	0	"	"	"
Do. Bullnose	4	0	0	"	"	"
Best Stourbridge Fire Bricks	3	14	0	"	"	"

GLAZED BRICKS.

Best White and Ivory Glazed Stretchers	12	0	0	"	"	"
Headers	11	0	0	"	"	"
Quoins, Bullnose, and Flats	16	0	0	"	"	"
Double Stretchers	19	0	0	"	"	"
Double Headers	16	0	0	"	"	"
One Side and two Ends	19	0	0	"	"	"
Two Sides and one End	20	0	0	"	"	"
Splays, Chamferred, Squints	20	0	0	"	"	"
Best Dipped Salt Glazed Stretchers, and Header	12	0	0	"	"	"
Quoins, Bullnose, and Flats	14	0	0	"	"	"
Double Stretchers	15	0	0	"	"	"
Double Headers	14	0	0	"	"	"
One Side and two Ends	15	0	0	"	"	"
Two Sides and one End	15	0	0	"	"	"
Splays, Chamferred, Squints	14	0	0	"	"	"
Second Quality White and Dipped Salt Glazed	2	0	0	"	less than best.	
Thames and Pit Sand		7	0	per yard, delivered.		
Thames Ballast		5	6	"		"
Best Portland Cement		27	0	per ton,		"
Best Ground Blue Lias Lime	19	0		"		"

NOTE.—The cement or lime is exclusive of the ordinary charge for sacks.

Grey Stone Lime ..... 11s. 6d. per yard, delivered.
Stourbridge Fireclay in sacks 27s. 0d. per ton at rly. dpt.

STONE

	s.	d.	
BATH STONE—delivered on road waggons, Paddington Depôt	1	6½	per ft. cube.
Do. do. delivered on road waggons, Nine Elms Depôt	1	8½	" "
PORTLAND STONE (20 ft. average)— Brown Whitbed, delivered on road waggons, Paddington Depôt, Nine Elms Depôt, or Pimlico Wharf	2	1	" "
White Basebed, delivered on road waggons, Paddington Depôt, Nine Elms Depôt, or Pimlico Wharf	2	2½	" "

PRICES CURRENT.—*Continued on page 310.*

List of Competitions, Contracts, etc.

For some Contracts still open, but not included in this List, see previous issues. Those with an asterisk (*) are advertised in this Number: Competitions, —; Contracts, iv. vi. viii. x.; Public Appointments, xvii.; Auction Sales, xxvi. Certain conditions, beyond those given in the following information, are imposed in some cases, such as: the advertisers do not bind themselves to accept the lowest or any tender; that a fair wages clause shall be observed; that no allowance will be made for tenders; and that deposits are returned on receipt of a bonâ-fide tender unless stated to the contrary.

Competitions.

OCTOBER 20. — **Highbridge.** — SEWERING.—Highbridge Urban District invite competitive plans for the sewering of the northern portion of the district. A premium of 20*l.* will be paid for the scheme approved and accepted. Particulars may be obtained from Mr. W. C. Shier, Highbridge, Somerset, Surveyor to the Council. Plans and estimates to be deposited with Mr. B. C. Board, Clerk to the Council, Urban Council Offices, Highbridge, Somerset, by 12 o'clock noon on October 20, endorsed "Proposed Sewer."

OCTOBER 22.—**Gaywood.**—SCHOOL.—Norfolk Education Committee are desirous of obtaining by competition plans, specifications, elevations, and estimates for a new school. A plan of the site and other particulars can be obtained on application to the Secretary at the County Education Office, 57, London-street, Norwich. Plans must be received at that office on or before October 22.

NO DATE. — **Leven.** — CO-OPERATIVE BUILDINGS. — Leven Reform Co-operative Society, Ltd., want competitive plans for new building purposed to be erected in Durie-street, Leven. Plans to be sent to Secretary by the last week of September. Further particulars can be had on application to Mr. D. C. Wilson, Secretary, on Wednesdays and Saturdays.

Contracts.

BUILDING.

SEPTEMBER 8.—**Shipley.**—ADDITIONS TO SCHOOLS.—Alterations and additions to the Salt Schools, Shipley. Send in their names to Mr. Sam Bradley, architect, Yorkshire Bank Chambers, Shipley, not later than September 8.

SEPTEMBER 10.—**Alnwick.**—CO-OPERATIVE PREMISES.—The Amble Co-operative Society, Ltd., invite tenders for the erection of branch premises at Alnwick. Quantities can be obtained upon application to Mr. E. G. Ekins, Architect, Co-operative Wholesale Society, West Blandford-street, Newcastle-on-Tyne. Tenders, endorsed "Alnwick New Building," will be received at the Society Office, Queen-street, Amble, up to 12 o'clock noon, September 10. Mr. E. Foreman, Secretary.

SEPTEMBER 10.—**Hull.**—EXTENSION OF WORKS.—For excavator, bricklayer, and concretor's works in extension of Tin Cannister Works, Stoneferry, Hull, for Mr. John Wilson. Plans may be seen, and particulars obtained, at offices of Messrs. Runton & Barry, architects, upon depositing 1*l.* 1s. Sealed tenders to be delivered to the architects on or before 11 a.m., September 10.

SEPTEMBER 10. — **Rhymney.** — ALTERATIONS, ETC. — Alterations and building additions to "Tymawr," Rhymney. Plans and specification can be seen at "Tymawr," or at office of Mr. T. Roderick, architect, Ashbrook House, Aberdare, where bills of quantities can be obtained on application. Endorsed tenders to be sent in to Mr. T. Edwards, "Tymawr," Rhymney, not later than September 10.

SEPTEMBER 10.—**Tylorstown.**—VILLA.—For Pastor's villa, Ebenezer (Tylorstown). The plans and specifications can be seen with Mr John Edward Jones (Chairman), Hendrefadog Shop, Tylorstown. The tenders to be sent (sealed and endorsed) to Mr. Thomas Hill (Secretary), 13, Church-terrace, Tylorstown, not later than September 10.

SEPTEMBER 11. — **Coed-Ely.** — BUNGALOWS. — Four bungalows at Coed-Ely, near Llantrisant, for the Welsh Navigation Steam Coal Company. Plans and specifications may be seen at the office of Mr. P. J. Jones, architect, Cilfynydd, Pontypridd, to whom tenders are to be sent on or before September 11.

SEPTEMBER 11.—**Gravesend.**—REGISTRAR'S ROOM.—Gravesend Hospital Committee invite tenders for the erection of a registrar's room at the Hospital. Plan and specification may be seen on application to the Secretary at the Hospital, and all tenders must be sent in not later than 4 p.m. on September 11.

SEPTEMBER 12. — **Greenock.** — SCHOOL. — Greenock Burgh School Board invite tenders for (1) digger, mason, and brick works; (2) carpenter, joiner, and ironmongery works; (3) cast-iron and steel works; (4) plumber work; (5) slater work; (6) plaster work; (7) granolithic work; (8) tile work; (9) electric lighting; (10) painter work, required in connexion with the erection of Cartsburn Public School, Greenock, according to plans by Messrs. Salmon & Son & Gillespie, F.R.I.B.A., I.A., architects. Schedules of quantities and form of tender can be obtained on application to Mr. A. F. Niven, Clerk of Board, Burgh School Board Offices, Municipal Buildings, Greenock, on payment of a deposit of 1*l.* for each schedule. Sealed tenders, on the prescribed form, must be delivered to Mr. A. F. Niven, Clerk to the Greenock Burgh School Board, Municipal Buildings, Greenock, not later than 11 o'clock a.m. on September 12.

SEPTEMBER 12.—**Wainstalls, Halifax.**—SHED.—The erection of a shed at Wainstalls, near Halifax. Plans and specifications can be seen at offices of Messrs. I. & I. Calvert, Halifax. Sealed tenders must be delivered not later than 4 o'clock on September 12.

SEPTEMBER 12.—**York.**—CLUB HOUSE.—The Committee of the York Golf Club invite tenders for the erection of a new club house near York. Drawings and specifications may be inspected at the offices of Mr. J. Edmund Jones, solicitor, 1, Market-street, York, between the hours of 10 a.m. and 5 p.m. Tenders (on the form supplied) are to be addressed and delivered to the Chairman, York Golf Club Committee, 1, Market-street, York, on or before September 12, sealed and endorsed "Tender for New Golf Club House."

SEPTEMBER 13. — **Lincoln.** — ALTERATIONS. — Alterations to the "Black Goats" Hotel, High-street, Lincoln, belonging to Mr. J. H. Newton. Plans, specifications, and quantities are now ready, and a copy of the latter can be obtained on application to offices of Messrs. Sheppard & Lockton, architects, Bargate, Newark-on-Trent. Sealed and endorsed tenders to be sent to architects on or before September 13, not later than 9 o'clock a.m.

SEPTEMBER 14. — **Low Bradfield.** — ADDITIONS TO SCHOOLS.—The West Riding Education Committee invite tenders in connexion with the additions, etc., to Low Bradfield Provided School, near Sheffield. Plans may be seen, and quantities obtained, on application to office of Mr. J. Vickers-Edwards, County Architect, County Hall, Wakefield. Sealed tenders, properly endorsed, to be sent not later than 10.30 on the morning of September 14.

SEPTEMBER 15.—**Bargoed.**—VESTRY.—The erection of a vestry at Bargoed for the Welsh Baptist Denomination. Tenders to be sent in to Mr. Mark Old, 20, Henry-street, Bargoed, on or before September 15. Plans and specification may be seen with the above or with Mr. P. Vivian Jones, P.A.S.I., architect and surveyor, Hengoed.

SEPTEMBER 17.—**Gowerton, Caerau, etc.**—SCHOOL WORKS.—The Glamorgan C.C. invite tenders for:—(1) Heating the Gowerton Council School with the low-pressure hot-water system; (2) alterations and additions at the Blaenllynfi Council School, Caerau, near Maesteg; (3) new temporary Cookery and Infants' School at the Troedrhiwfuwch Council School; (4) new classrooms to the mixed department at Ely Council School; (5) minor alterations and additions at Pontyrhyl Council School. Plans and specification may be seen, and copies of the bills of quantities obtained for works No. 2 at the Caerau Police-station, Maesteg; for works No. 3, at the Pontlottyn Police-station; and for work No. 4 at offices of the Clerk. Plans and specification of work No. 1 may be obtained at the Gowerton Police-station. Plans of work No. 5 may be seen, and copies of the specification obtained, at the Pontyrhyl Police-station. The plans and documents for all the works may be seen or obtained at offices of Mr. T. Mansel Franklen, Clerk of the Glamorgan C.C., Glamorgan County Offices, Westgate-street, Cardiff. Tenders, made out on the form supplied, including the names of two substantial sureties, are to be delivered to the Clerk not later than September 17, marked outside "Tender for Heating Gowerton School" or "Tender for Alterations at Blaenllynfi School," etc., etc., as the case may be.

SEPTEMBER 18. — **Carmarthen.** — SANITARY BLOCK.—For building a sanitary block at the Carmarthenshire Infirmary, Carmarthen. Plans and specifications may be seen on application to Messrs. George Morgan & Sons, F.R.I.B.A., A.R.I.B.A., architects. Tenders are to reach Mr. Howell Howell, Secretary, the Infirmary, Carmarthen, on or before September 18.

SEPTEMBER 18.—**Eldon Lane and Sedgefield.**—SCHOOLS.—Durham County Education Committee invite tenders for erection of new schools at Eldon Lane and Sedgefield. Plans, specifications, and general conditions of contract, and bills of quantities can be seen as follows:—For Eldon Lane, at the office of Messrs. Vaux & Mark, architects, 29, Norfolk-street, Sunderland; for Sedgefield, at the office of the Education Committee's Architect, Shire Hall, Durham. Sealed tenders, endorsed "Eldon Lane (or Sedgefield) Council School Tender," are to be sent on or before September 18, addressed to the Secretary for Elementary Education, Shire Hall, Durham.

* SEPTEMBER 18.—**Tottenham.**—LIBRARY EXTENSION.—The Tottenham U.D.C. invite tenders for extensions to the Central Public Library, Tottenham. Plans can be seen, and general conditions, specifications, bills of quantities, schedule of prices, and forms of tender can be obtained, on application to Mr. W. H. Prescott, Council's Engineer, Council Buildings, The Green, Tottenham, on payment of 10s. 6d. Persons tendering must deposit 5*l.* when handing in their tenders. Sealed tenders, on the form supplied, endorsed "Tender for Extensions to Central Public Library," to be delivered to Mr. E. Crowne, Clerk of the Council, Tottenham, by 12 noon, September 18.

SEPTEMBER 19. — **Blanchardstown, Dublin.** — WALL.—North Dublin R.D.C. invite tenders for raising and concreting the boundary wall in front of the ten labourers' cottages at Blanchardstown, in accordance with the specification for same, which can be seen and copied at office of Mr. John O'Neill, Clerk of the Council, North Brunswick-street, Dublin. Sealed tenders will be received in the tender box up to 11 o'clock a.m. on September 19.

SEPTEMBER 19.—**Liverpool.**—WASHHOUSE, ETC.—The West Derby Guardians invite tenders for proposed new washhouse, clothes store, boundary walls, etc., at the Lower Hospital, Mill-road Infirmary, from contractors having places of business and workshops and being *bonâ fide* contractors carrying on business within the Unions of West Derby, township of Toxteth Park, or the Parish of Liverpool. A set of quantities can be obtained from Mr. Harris P. Cleaver, Clerk to the Guardians, Brougham-terrace, West Derby-road, Liverpool, on payment of 1*l.* 1s. Specifications and drawings can be seen at the office of the architect, Mr. C. H. Lancaster, Brougham-terrace, West Derby-road, Liverpool. Sealed tenders, endorsed "Tender for Additions to Lower Hospital," and addressed to the Clerk, must be delivered not later than 9 o'clock a.m. on September 19.

SEPTEMBER 20. — **Rathmines.** — BUILDERS' WORK. — The U.D.C. of Rathmines invite tenders for sundry builders' work at their Electricity Works. Drawings, general conditions, and specification may be inspected at the Rathmines Electricity Works, and copies of the bill of quantities, conditions, and specification obtained, on making a deposit of 1*l.* Tenders (sealed and marked "Tender for Buildings") must be addressed to Mr. F. P. Fawcett, Clerk to the Council, Town Hall, Rathmines, Co. Dublin, and be delivered not later than 10 o'clock in the forenoon on September 20.

* SEPTEMBER 21.—**Mill Hill.**—NEW SORTING OFFICE. —The Commissioners of H.M. Works and Public Buildings invite tenders for a new sorting office at Mill Hill, N. Drawings, specification, and a copy of the conditions and form of contract may be seen on application to Mr. J. Wager, H.M. Office of Works, Westminster, S.W. Bills of quantities and forms of tenders may be obtained at the undermentioned address, on payment of 1*l.* 1s. Tenders must be delivered before 12 noon, September 21, addressed to the Secretary, H.M. Office of Works, etc., Storey's Gate, S.W., and endorsed "Tender for Mill Hill Sorting Office."

* SEPTEMBER 21. — **Poplar.** — REPAIRS, ETC. — The London County Council invite tenders for repairs at the Mansion in The Island Garden, Poplar. Drawings may be inspected, and specifications, bills of quantities, form of tender, etc., obtained, at the Architects' Department, 15, Pall Mall East, S.W., on deposit of 10s. Tenders to be delivered at County Hall, addressed to the Clerk, Spring Gardens, S.W., endorsed "Tender for Repairs, etc., at The Mansion, The Island Gardens," not later than 10 a.m., September 21.

* SEPTEMBER 21.—**Wormwood Scrubs.**—ERECTION OF LODGE.—The London County Council invite tenders for the re-erection of a lodge at Wormwood Scrubs, W. Drawings may be seen, and specifications, bills of quantities, form of tender, etc., obtained, from the Architects' Department, 15, Pall Mall East, S.W., on deposit of 10s. Sealed tenders to be delivered at County Hall, addressed to the Clerk, Spring Gardens, S.W., and endorsed "Tender for the Re-erection of a Lodge at Wormwood Scrubs," not later than 10 a.m. on September 21.

* OCTOBER 3. — **Devizes.** — SHEDDING. — The Council of the Wiltshire Agricultural Association invite tenders for erection of shedding and the whole of the other necessary works in connexion with the show yard for the meeting to be held at Devizes in 1907. Specifications of the work required and forms of tender may be obtained of the Secretary of the Association, Market Lavington, Devizes, on payment of 1*l.* 1s. Tenders, on such forms, must be delivered by 10 a.m., October 3, sealed and endorsed "Tender for Shedding," to the Secretary.

OCTOBER 4. — **Levenshulme.** — TECHNICAL SCHOOL. — The Levenshulme U.D.C. invite tenders for the erection and completion of the new Technical School proposed to be erected at the rear of the Chapel-street Council School, Chapel-street, Levenshulme. Specifications, bills of quantities, and further particulars may be obtained on application to the architect, Mr. Henry Littler, 16, Ribblesdale-place, Preston, on payment of 3*l.* 3s. Tenders, endorsed "Tender for New Technical School," to be sent to Mr. J. Ogden Hardicker, Clerk, Northern Assurance Buildings, Albert-square, Manchester, on or before October 4.

NO DATE. — **Grimston.** — RESIDENCE. — The erection and completion of a double-fronted residence, with outbuildings, at Grimston, Norfolk. Plans, specifications, and quantities, with all particulars and information, can be obtained upon application at the offices of the architect, Mr. Louis F. Eagleton, King-street, King's Lynn.

NO DATE. — **Halesworth.** — GASHOLDER TANK. — Halesworth Gas Company invite tenders for the building of a brick gasholder tank, approximate dimensions 51 ft. by 21 ft. Specifications and particulars on application to Mr. A. Foreman, Manager, 46, Thoroughfare, Halesworth.

NO DATE.—**Raskelf.**—FARM-HOUSE.—The erection of a farm-house at Cold Harbour, Raskelf, near Easingwold, for the Ecclesiastical Commissioners. Names to Mr. Thomas Stokes, architect, Thirsk.

ENGINEERING, IRON, AND STEEL.

SEPTEMBER 9. — **Leigh.** — GIRDER TROUGHS.—Leigh Gas and Water Committee invite tenders for the supply of two girder troughs and supporting standards, together with 14-in. steel tubes for the purpose of crossing certain railways in Westhoughton. Further particulars, together with specifications and forms of tender, may be had, and detail drawings seen, at the offices of Mr. James

Gibson, gas and water engineer. Sealed and endorsed tenders to be addressed to Mr. Stanley Wilson, Town Clerk, Town Hall, Leigh, Lancs., and delivered not later than September 9.

SEPTEMBER 10.—**London.**—RAILS.—The Bengal and North-Western Railway Company invite tenders for the supply and delivery of :—2,360 tons of 50-lb. steel rails, and 66⅔ tons steel fishplates for ditto, as per specification to be seen at the Company's Offices. Tenders, addressed to Mr. Alexander Izat, Managing Director, 237, Gresham House, Old Broad-street, London, E.C., and marked "Tender for Rails and Fishplates," are to be lodged not later than noon on September 10. For each specification a fee of 10s. will be charged, which cannot, under any circumstances, be returned.

SEPTEMBER 13.—**Portsmouth.**—REPAIRING PUMPS, ETC.—Portsmouth Corporation invite tenders for repairing the main pumps and engine at the Eastney Pumping Station, in the Borough of Portsmouth. The specification may be seen, and a form of tender obtained, at the Borough Engineer's Office at the Town Hall. The form of tender is to be completely filled in and sent under cover to reach Mr. Alexander Hellard, Town Clerk, Town Hall, Portsmouth, not later than 10 a.m. on September 13.

SEPTEMBER 13.—**Tullamore.**—SECTIONAL BOILER AND IRONWORK.—The Finance Committee of the King's C.C. will, at their meeting, to be held on September 13, in the Court-house, Tullamore, will proceed to consider tenders for taking down the existing boiler and brickwork and supplying, erecting, and connecting with existing water pipes and smoke flue a cast-iron sectional boiler, including all necessary fittings, in the Court-house, Tullamore. At the same meeting tenders will be considered for repairing the ironwork of the furnace chamber connected with the Crown Court of the Court-house. The specifications for the work in question can be inspected at office of Mr. James Delany, County Surveyor, the Court-house, Tullamore, any week-day between the hours of 10 and 5 (except Saturdays, 10 to 2). Tender for each work, marked respectively "Boiler" and "Repairs," will be received up to 11 o'clock on the morning of the day of the meeting.

SEPTEMBER 17.—**Birmingham.**—BRIDGE WORK.—Birmingham Tramways Committee invite tenders for works in connexion with the widening of Lancaster-street Canal Bridge :—Contract No. 1. The drawings and specification may be inspected, and quantities and forms of tender obtained, on deposit of 1*l.*, at the offices of Mr. Henry E. Stilgoe, M.Inst.C.E., City Engineer and Surveyor, Council House, Birmingham. Tenders, endorsed "Lancaster-street Bridge," to be delivered at office of Engineer on or before September 17.

SEPTEMBER 17.—**London.**—PIPE LAYING.—The Metropolitan Water Board invite tenders for the laying and jointing, etc., of 42-in. and other cast-iron pipes between Child's Hill and Cranley Gardens, and other necessary works in connexion therewith. Forms of tender, with schedule and conditions of contract, may be obtained, and drawings inspected, upon application to the engineer, at "The Firs," Southern-road, Fortis Green, East Finchley, N., on production of an official receipt for the sum of 5*l.* Such payments and applications must be made between the hours of 10 and 4 (except on Saturdays). Tenders, enclosed in sealed envelopes, addressed to the Clerk of the Board, and endorsed "Tender for Aqueduct, Child's Hill to Cranley Gardens," must be delivered at the Offices of the Board not later than 10 a.m. on September 17.

SEPTEMBER 19.—**Rotherham.**—MACHINERY FOR BATHS.—Rotherham Corporation invite tenders for laundry machinery and fittings required at the Public Baths, also from builders for structural alterations. Plans and specifications may be seen, and further particulars obtained, by applying at the offices of Mr. J. Platts, Corporation Architect. Tenders, endorsed "Laundry Machinery for Baths," to be sent to Mr. W. J. Board, Town Clerk, Town Hall, Rotherham, not later than September 19.

SEPTEMBER 24.—**Lambeth.**—ECONOMISING WORKS.—Lambeth Board of Guardians invite tenders for utilising the exhaust steam from the various parts of the Workhouse in Renfrew-road, Lower Kennington-lane, S.E. Firms making a speciality of this class of work will be shown over the building by appointment made with the Consulting Engineer to the Guardians, Mr. George, E. Arnold, 195, Kennington-road, S.E. Sealed estimates must be delivered to the Clerk to the Guardians, at the Guardians' Offices, Brook-street, Kennington-road, S.E., not later than September 24, superscribed "Estimate for Economising Works."

OCTOBER 15.—**Johannesburg.**—MOTORS.—The Town Council of Johannesburg invite tenders for the supply and delivery, f.o.b., at a port suitable for shipment to South Africa, of :—One-phase alternate-current motors with accessories. Tenders are to be addressed to the Town Clerk, Municipal Offices, Johannesburg, and must reach him not later than October 15. The general conditions, specification, and forms of tender may be seen at the Offices of the Council's Consulting Engineers, Messrs. Mordey & Dawbarn, 82 Victoria-street, Westminster, S.W., and may be obtained from them on payment of 5*l.* 5*s.*

MISCELLANEOUS.

SEPTEMBER 8.—**Dublin.**—ELECTRICITY METERS.—Dublin Lighting Committee invite tenders for the supply of the following :—500 alternating current meters, single-phase and three-phase. Specification, with terms and conditions, and form of tender, may be inspected at the office of the City Electrical Engineer, Fleet-street, Dublin, and may be obtained on payment of 5*l.* Tenders (sealed and marked "Tender for Electricity Meters") must be addressed to "The Chairman, Lighting Committee, 3, Corkhill, Dublin," and be delivered not later than 12 o'clock noon on September 8.

SEPTEMBER 8.—**Gressenhall.**—WINDOWS.—Mitford and Launditch Guardians invite tenders for the supply and fixing at the Workhouse, Gressenhall, of seven new windows and work in connexion therewith, in accordance with specifications, which may be inspected at any reasonable time at the Workhouse. Tenders, marked "Windows," should be sent to Mr. Walter M. Barton, Clerk to the Guardians, The Guildhall, East Dereham, on or before September 8.

SEPTEMBER 10.—**West Kirby.**—BOWLING GREEN.—The U.D.C. of Hoylake and West Kirby invite tenders for excavating, levelling, and turfing to a proper chamber a bowling green at the Upper Park, West Kirby, and executing any other work specified in the quantities. Plans, specifications, and quantities may be seen at the Engineer's Office, Town Hall, Hoylake. Sealed tenders, addressed to the Chairman of the Parks Committee, and endorsed "Tender for Bowling Green," to be delivered at the Town Hall, Hoylake, not later than 12 noon on September 10.

SEPTEMBER 12.—**Colchester.**—THE REMOVAL OF REFUSE.—The Guardians invite tenders for the refuse of the Workhouse, to be removed weekly or oftener, for one year, from September 30, 1906, to October 5, 1907, inclusive. Tenders to be delivered, sealed up, at the Workhouse, not later than September 12, and marked outside, "Tender for House Refuse." Mr. Charles E. White, Clerk, 57, Northhill, Colchester.

SEPTEMBER 13.—**Belfast.**—DRY METERS.—Belfast Gas Department invite tenders for the supply of dry meters (ordinary and prepayment) for one year, from October 1, 1906. Tenders, endorsed "Tender for Meters," must be delivered at office of Sir Samuel Black, Town Clerk, not later than September 13.

SEPTEMBER 13.—**Hatton.**—BUILDING MATERIAL.—The Committee of Visitors of Warwick County Lunatic Asylum, Hatton, near Warwick, invite builders and merchants to contract for the supply of building materials for the ensuing twelve months, from October 1, 1906, to September 30, 1907. Forms of tender may be obtained, and samples of materials used can be seen, at the Institution, and must be returned by September 13.

SEPTEMBER 15.—**Aylesbury.**—SCAVENGING.—Aylesbury R.D.C. invite tenders from persons willing to clean out and collect the refuse from the earth closets, privies, ashpits, and cesspools, and other house refuse, for the following parishes: No. 1, Aston Clinton; No. 2, Weston Turville; No. 3, Lower Buckland and Buckland Wharf, for the half-year ending March 31, 1907, such refuse to be collected each week, and to become the property of the contractor. A proper scavenging cart or carts must be provided by the contractor. Tenders must be made for one or more of the above-mentioned parishes, and the price for each parish must be separately mentioned. Persons desirous of tendering must apply to Mr. W. E. Stanley, Inspector of Nuisances, Stocklake, Aylesbury, at whose office the form of contract which will have to be entered into may be inspected. Tenders are to be forwarded to Mr. F. B. Parrott, Clerk, Aylesbury, at office in Bourbon-street, on or before 12 o'clock at noon, on September 15.

SEPTEMBER 15.—**Horton.**—SCAVENGING.—For scavenging the Parish of Horton. Specification and form of contract may be seen at office of Mr. C. P. Summerhayes, Clerk to Parish Council, Horton, Slough. Tenders (endorsed "Scavenging") to reach the Clerk by September 15.

SEPTEMBER 18.—**Langley.**—SCAVENGING.—Scavenging the Parish of Langley Marish. Specification and form of contract may be seen at office of Mr. T. H. Baldwin, Clerk to the Parish Council, Middle Green, Langley, Bucks. Tenders (endorsed "Scavenging") to reach the Clerk by 10 a.m., September 18.

SEPTEMBER 20.—**Belfast.**—GAS STOVES, ETC.—Belfast Gas Committee invite tenders for the supply of gas cookers, heating stoves, and other appliances, for one year from October 1, 1906. Tenders, endorsed "Tenders for Gas Appliances," addressed to Sir Samuel Black, Town Clerk, Belfast, are to be furnished not later than September 20.

PAINTING, etc.

SEPTEMBER 11.—**Halifax.**—PAINTING.—The Markets Committee of the Halifax Corporation invite tenders for the (1) painting work required to the exterior of the Borough Markets; (2) painting railings, cottages, toll house, etc., at the Victoria Cattle Market; and (3) the whitewashing work required at the slaughterhouses, Market Hall, and the Borough Markets. The Improvement Committee invite tenders for painting property in West Grove-terrace, Hopwood-lane, Bolton-street, Beacon Hill-road, and Bird Cage. Specifications, quantities, and forms of tender may be obtained on application to Mr. James Lord, C.E., Borough Engineer, Town Hall, Halifax. Tenders, properly endorsed, and in separate envelopes for the Markets Committee and the Improvement Committee, must be sent to Mr. Keighley Walton, Town Clerk, not later than 12 o'clock noon on September 11.

SEPTEMBER 12.—**Belfast.**—PAINTING.—Belfast Cemetery and Parks Committee invite tenders for painting at the various parks. Specification may be seen in the City Surveyor's Office. Sealed tenders, endorsed "Tender for Painting at Park," to be lodged in office of Sir Samuel Black, Town Clerk, before 11 o'clock a.m. on September 12.

SEPTEMBER 14.—**Chelmsford.**—PAINTING.—The Town Council of Chelmsford invite tenders for painting the outside of house and premises, No. 10, Duke-street, Chelmsford, belonging to the Corporation. Particulars can be obtained of, and specification seen at the Office of, the Borough Surveyor, 16, London-road, Chelmsford. Tenders to reach Mr. Thos. Dixon, Town Clerk, Chelmsford, by September 14.

SEPTEMBER 14.—**Preston.**—PAINTING.—Preston Corporation invite tenders for painting, etc., the Fire Station, Tithebarn-street. Specification may be seen, form of tender, and all particulars obtained, at the Office of the Borough Surveyor, Town Hall, Preston, to whom sealed tenders, endorsed "Tender for Painting, etc., Fire Station," must be delivered not later than 12 o'clock at noon on September 14.

SEPTEMBER 17.—**Cheshunt.**—PAINTING, ETC.—Cheshunt U.D.C. invite tenders for cleaning, painting, and decorating the "Manor House," Turners-hill, together with various structural alterations and renovations, and the building of a strong room in the present basement. Plans may be seen, together with specification, and forms of tender obtained, upon application at office of Mr. Reginald H. Jeffes, A.M.I.C.E., Engineer and Surveyor to the Council, Manor House, Cheshunt, during office hours. Tenders, in envelopes supplied, to be delivered not later than 4 p.m. on September 17.

SEPTEMBER 18.—**Hull.**—PAINTING.—Hull Education Committee invite tenders for the external painting of the Municipal Technical School. Particulars and forms of tender can be obtained at offices of Mr. J. T. Riley, Secretary of Education, Education Offices, Albion-street, Hull. Sealed tenders, duly endorsed and addressed to the Secretary of Education, must be delivered not later than 5 p.m. on September 18.

SEPTEMBER 20.—**Mitcham.**—PAINTING.—Croydon R.D.C. invite tenders for repairs and painting required at the Isolation Hospital, Beddington Corner, Mitcham. Copies of specifications and forms of tender can be obtained at the office of the Council's Surveyor, Mr. R. M. Chart, F.S.I., on payment of a deposit of 1*l.* Tenders to be delivered to Mr. E. J. Gowen, Clerk of the Council, Town Hall, Croydon, before 12 o'clock noon on September 20.

SEPTEMBER 29.—**Branksome.**—PAINTING.—For cleaning and painting police-station. Specifications, prepared by the County Surveyor, can be seen at the station. Tenders to be sent to Mr. E. Archdall Ffooks, Sherborne, on or before September 29.

NO DATE.—**Castleford.**—PAINTING, ETC.—The Castleford U.D.C. invite tenders for the works of painting, etc., at the Castleford Market Hall, in accordance with the quantities and specification prepared by Mr. W. Green, Surveyor to the Council, and copies of which may be obtained on a deposit of 1*l.* 1*s.* Mr. H. H. Broadbent, Clerk to the Council, Council Offices, Castleford.

ROADS, SANITARY, AND WATER WORKS.

* SEPTEMBER 10.—**Hendon.**—MAKING-UP ROAD.—The Hendon U.D.C. invite tenders for certain works of kerbing, channelling, metalling, tar paving, gullies, etc., and other works in fully making-up the first portion of Stanley-road, West Hendon. Drawings and specifications may be seen, and forms of tender obtained, on application to Mr. S. Slater Grimley, Council's Engineer, Hendon, N.W., on deposit of 10*l.* Sealed tenders, endorsed "Private Improvements," addressed to the Chairman of the Council, to be sent to Mr. H. Humphries, Clerk, Council Offices, The Burroughs, Hendon, N.W., before 4 p.m., September 10.

SEPTEMBER 10.—**Morley.**—WIDENING ROAD.—Morley Highways Committee invite tenders for the whole of the work required to be done in the improvement and widening of Wide-lane, within the borough, including excavating, building of a retaining wall, kerbing, flagging, and channelling. Plans and specifications may be seen, and bills of quantities obtained, on application at office of Mr. W. E. Putman, A.M.Inst.C.E., Borough Engineer and Surveyor, Town Hall, Morley. Tenders, sealed and endorsed "Wide-lane Improvement," to be delivered at the Town Clerk's Office, Town Hall, Morley, not later than noon on September 10.

SEPTEMBER 11.—**Leeds.**—PRIVATE STREET WORKS.—Leeds Highways Committee invite tenders for the paving and flagging of the following streets :—Hovingham-terrace, Hovingham Mount, back Hovingham-terrace, back Hovingham Mount, back Dorset-road, Pasture-road, Shepherd's-place, Darfield-street, Darfield-place, Powell-street, Marley-grove, and Marley View. Drawings may be seen at the City Engineer's Office, Municipal Buildings. Forms of tender and bills of quantities may be obtained, and copies of the documents forming the contract inspected, on application at the Highways Office, 155, Kirkstall-road. Sealed tenders, endorsed "Tender for Private Street Works," and addressed to the Highways Committee, must be delivered at the Town Clerk's Office, Town Hall, Leeds, not later than 10 a.m. on September 11.

SEPTEMBER 12.—**Ebbw Vale.**—REPAIRING FILTER BED.—Ebbw Vale U.D.C. invite tenders for the work required in repairing one of the filter beds at their Llangynider Waterworks. Plan and specification may be seen, and form of tender, with bill of quantities, obtained by appointment at the office of Mr. T. J. Thomas, Engineer, District Council Office, Ebbw Vale. A deposit of 10s., which must be in postal orders, will be required from each person who obtains a copy of the form of tender and bill of quantities. Tender, enclosed in a sealed envelope, endorsed on the outside "Tender for Repairing Filter Bed," must be delivered at office of Mr. Thomas Hughes, Clerk, Ebbw Vale, not later than September 12.

SEPTEMBER 12.—**Roath and Canton.**—PRIVATE STREET WORKS.—Cardiff Corporation invite tenders for forming, metalling, paving, kerbing, and channelling the following streets at Roath and Canton :—Shirley-road, Tydfil-place, Monthermer-road, Penywain-road, Rhymney-lane, Tydfil-lane, Shirley-lane, Ninian-lane, Monthermer-lane, Orchard-place, and Daisy-street. Separate tenders are required for :—(1) Forming and metalling the carriageways; (2) paving, kerbing, and channelling the footways. Drawings and specifications may be seen, and forms of tender obtained, at the Office of Mr. W. Harpur, M.Inst.C.E., City Engineer, Cardiff. Sealed tenders, endorsed "Tender for Private Street Works," are to be delivered at office of Mr J. L. Wheatley, Town Clerk, Town Hall, Cardiff, on or before September 12.

SEPTEMBER 12.—**Tullibody.**—SEWAGE WORKS.—The C.C. of Clackmannanshire invite offers for the work to be done in laying sewers and constructing sewage tank, in the special drainage district of Tullibody. Drawings can be seen in the office of Sir W. R. Copland, C.E., 146, West Regent-street, Glasgow, and copy of specification and duplicate copies of schedule of quantities may be obtained from him on payment of a fee of 10s. 6d. Sealed offers, endorsed "Tender for Sewage Works, Tullibody," to be lodged with Mr. J. W. Moir, County Clerk, Alloa, by 12 noon on September 12.

SEPTEMBER 13.—**Cowpen.**—FLAGGING.—Cowpen U.D.C. invite tenders for flagging the bottom and slopes of a settling pond at Choppington Colliery

(area of concrete flagging about 1070 sq yds.). Plans and specification may be seen, and forms of tender obtained, at the Offices of Mr. Robert Grieves, Surveyor to the Council, Seaforth-street, Blyth. Sealed tenders, endorsed "Tender for Flagging," must be delivered not later than 4 p.m. on September 13.

SEPTEMBER 14.—**Buckie.**—WATER SUPPLY.—Buckie Town Council of the Burgh of Buckie invite offers for the work to be done in providing an increased and improved water supply to the Burgh. Copies of the drawings may be seen here, and also in the office of Sir W. R. Copland, C.E., 146, West Regent-street, Glasgow; and copies of specification, and duplicate copies of schedule of quantities, may be obtained on payment of a fee of 21s. An assistant engineer will meet contractors at the Commercial Hotel, Buckie, on September 8, at 11 a.m., and will show them over the ground. Sealed offers, endorsed "Tender for Water Works," to be addressed to Mr. John L. M'Naughton, Town Clerk, Burgh Chambers, Buckie, and lodged with him by 12 noon on September 14.

SEPTEMBER 14.—**Preston.**—PAVING, ETC.—Preston Corporation invite tenders for the works required in levelling, paving, flagging, channelling, etc., Salmon-street, from Surrey-street to No. 38, and Fishwick-road, from Salmon-street to Fishwick-parade. Plans, sections, and specifications may be seen, and schedule of quantities and form of tender obtained, at the Office of the Borough Surveyor, Town Hall, Preston, to whom sealed tenders, endorsed "Tender for Paving, etc.," must be delivered not later than 12 o'clock at noon on September 14.

SEPTEMBER 17.—**Seaford.**—SEWER.—The Seaford U.D.C. invite tenders for the construction of about 1,300 yds. of 9-in. pipe sewer, with manholes and other incidental works, in Firle-road and Blatchington-street, within their district. Plan and specification may be seen, and bill of quantities obtained, at the office of the engineers, Messrs. Pollard & Tingle, MM.I.C.E., 31, Old Queen-street, Westminster, S.W. Sealed tenders, endorsed "Firle-road Drainage," to be sent to Mr. W. H. Pawson, Clerk, Council Offices, 3, Clinton-place, Seaford, Sussex, not later than 4 p.m., September 17.

SEPTEMBER 18.—**Spennymoor.**—FOOTPATH.—The Spennymoor U.D.C. invite tenders for the supplying and laying of new concrete flags and kerbing for a portion of High-street, Spennymoor. Plans, specifications, may be seen, and forms of tender obtained, on application to Mr. C. R. Spencer, Surveyor to the Council, Silver-street, Spennymoor. Tenders, marked "High-street Footpath," to be sent to Mr. F. Badcock, Clerk to the Council, Council Offices, Spennymoor, not later than September 18.

SEPTEMBER 19.—**Ely, Llandaff.**—SEWER.—Llandaff and Dinas Powis R.D.C. invite tenders for the construction of about half a mile of 9-in. cast-iron pipe sewer, together with the necessary manholes, etc., etc., at Ely, in the Parish of Llandaff, in accordance with plans and specification, which may be seen, and bills of quantities and forms of tender obtained, at the office of Mr. Baldwin Latham, M.Inst.C.E., Parliament-mansions, Victoria-street, Westminster, S.W., or at the office of Mr. James Holden, A.M.Inst.C.E., the Engineer of the Council, Park House, 20, Park-place, Cardiff. Sealed tenders, on the forms supplied, endorsed "Tender for Sewer," are to be delivered at office of Mr. M. Warren, Clerk to the Council, Park House, Park-place, Cardiff, on or before 12 o'clock noon on September 19.

SEPTEMBER 20.—**Inverness.**—PAVING.—Inverness Town Council invite tenders for the paving of Waterloo Bridge with Australian Karri wood blocks. Specification may be seen, and schedule of quantities obtained, at the office of Mr. T. H. Scott, Burgh Surveyor, on payment of 10s. 6d. Offers, marked "Paving Waterloo Bridge," will be received by the Burgh Surveyor, not later than September 20.

SEPTEMBER 27.—**Killingdon.**—SEWER.—Uxbridge R.D.C. invite tenders for the providing, laying, and jointing of a stoneware pipe sewer in the above road, the construction of manholes, and erection of ventilating columns. Plan and specification may be seen at the office of Mr. J. Freebairn Stow, engineer, Surveyor's Office, Corn Exchange, Uxbridge, on and after September 10. Sealed tenders, endorsed "Long-lane Sewer," must be delivered at office of engineer not later than 4 p.m. on September 27.

SEPTEMBER 28.—**Pewsey.**—WELL AND BOREHOLE.—Pewsey R.D.C. invite tenders for sinking of a well, 10 ft. internal diameter, and 90 ft. deep, and for sinking from the bottom of such well a borehole, 12 in. internal diameter, and a further 110 ft. deep, together with other work in connexion therewith at Pewsey. The drawing and specification may be seen at office of Mr. S. B. Dixon, Clerk to the Pewsey R.D.C., Pewsey, from 10 a.m. to 5 p.m. each day except Saturdays. Copies of specification and form of tender and schedule may be obtained from the engineers (Messrs. Fairbank & Son, C.E., Lendal-chambers, York), on deposit of 2l. 3s. Sealed tenders, endorsed "Tender for Well and Borehole, Contract A," must reach the Clerk on or before 10 a.m. on September 28.

STONE, MATERIALS, AND STORES.

SEPTEMBER 8.—**Manchester.**—SETTS.—The Paving, Sewering, and Highways Committee of the Manchester Corporation invite tenders to be delivered before 10 a.m. on September 8 for supply of:—(1) 2,500 tons best solid Lonkey rock 6-in. Haslingden grit setts; (2) 2,000 tons 3 in. by 6 in. granite setts. Forms of tender may be obtained on application to the Chief Clerk, Paving, etc., Department, Town Hall, Manchester. Mr. Wm. Henry Talbot, Town Clerk, Town Hall, Manchester.

SEPTEMBER 11.—**Gelligaer.**—LIMESTONE.—Gelligaer and Rhigos R.D.C. invite tenders for supplying the undermentioned quantities of broken limestone (2-in. gauge) and gravel, delivered carriage paid at the following railway stations, viz.:—Darran, 150 tons limestone and 30 tons nut limestone and gravel; Fochriw, 200 tons limestone and 110 tons nut limestone and gravel; Pontlottyn, 400 tons limestone and 20 tons nut limestone and gravel; Tirphil, 140 tons limestone and 50 tons nut limestone and gravel; Brithdir, 80 tons limestone and 20 tons nut limestone and gravel; Bargoed, 600 tons limestone and 100 tons nut limestone and gravel; Pengam (R.R.), 340 tons limestone and 210 tons nut limestone and gravel; Hengoed (R.R.), 150 tons limestone and 60 tons nut limestone and gravel, Ffaldcaiach Siding, 250 tons limestone and 20 tons nut limestone and gravel; Bedlinog, 20 tons limestone and 200 tons nut limestone and gravel; Ystrad Mynach, 100 tons limestone and 30 tons nut limestone and gravel. Specification and form of tender may be obtained upon application to Mr. James P. Jones, Surveyor, Council Offices, Hengoed. Tenders, endorsed "Broken Limestone," must reach Mr. Frank T. James, Clerk, 134, High-street, Merthyr Tydfil, not later than September 11.

SEPTEMBER 15.—**Chorley.**—PAVING SETTS, ETC.—The Chorley Corporation invite tenders for the supply of the following articles, which may be required during a period of twelve months from October 1 next, viz.:—Paving setts and kerbs; flags, for street and other purposes; broken granite and chippings, for roads; limestone chippings; glazed earthenware pipes, for sewers and drains. Specification and form of tender may be obtained on application to Mr. Wm. Leigh, Borough Surveyor, Town Hall, Chorley. Tenders, endorsed "Paving Setts, etc.," to be forwarded to Mr. Jno. Mills, Town Clerk, Town Hall, Chorley, on or before September 15.

SEPTEMBER 19.—**Leigh-on-Sea.**—PIPES.—Leigh-on-Sea U.D.C. invite tenders for the supply and delivery of 22 tons, or thereabouts, of 4-in diameter and 3-in. diameter cast-iron pipes and specials. Particulars may be obtained on application to Mr. John W. Liversedge, C.E., Surveyor to the Council. Tenders to be signed, sealed, and delivered to the Clerk to the Council, Mr. Carlyle Croasdell, not later than September 19.

SEPTEMBER 20.—**Merthyr Tydfil.**—STORES.—Hills' Plymouth Company, Ltd., Merthyr Tydfil, invite tenders for the following stores for the twelve months ending September 30, 1907:—(1) bar and other iron; (2) castings; (3) bolts, nuts, rivets, nails, etc.; (4) indiarubber, asbestos, etc.; (5) colliers' tools, etc.; (6) leather goods; (7) girders, channels, and rails; (8) files, etc.; (9) steam tubes and fittings; (10) electric appliances; (11) oils, tallow, and grease; (12) timber, deals, etc. Forms of tender may be obtained upon application in writing, and must be sent in not later than September 20.

NO DATE.—**London.**—STORES.—The Directors of the Mersey Railway Company invite tenders for the supply of oil, grease, ironmongery, waste, castings, asbestos, and indiarubber goods, chemicals, brake blocks, firebricks, electrical sundries, and other general stores, for twelve months. Forms of tender may be had on application to the Secretary, Mr. Geo. H. Langham, Worcester House, Walbrook, London, E.C. Parties applying must state the particular contract or contracts for which they propose to tender. Samples and patterns may be seen at the Company's Office, James-street Station, Liverpool.

Public Appointment.

Nature of Appointment.	By whom Advertised.	Salary.	Applications to be in
*WORKING FOREMAN	Sleaford R.D.C.	Not stated	Sept. 14

Auction Sales.

Nature and Place of Sale.	By whom Offered.	Date of Sale.
*BUILDER'S PLANT AND STOCK, ETC., EALING—On the Premises, The Grove, Ealing	Robt. Newman	Sept. 11 & 12
*DEALS, BATTENS, ETC.—Great Hall, Winchester House, Old Broad-street, E.C.	Churchill & Sims	Sept. 12
*BRICKMAKING MACHINERY PLANT, ETC., NEWPORT, MON.—On the Premises	Chas. E. Parsons & Joliffe	Sept. 13
*BRICK-MAKING PLANT—Abbey Brickfields, Faversham	Jackson & Sons	Sept. 18
*BRICK-MAKING PLANT AND MACHINERY, CATFORD—On the Premises	J. T. Skelding	Sept. 27
*FREEHOLD BUILDING LAND, SHREWSBURY—The County Mart, Shrewsbury	Wm. Hall, Wateridge, & Owen	Sept. 28
*JOINERY WORKS HENRY-STREET, GRAY'S-INN-ROAD	May & Rowden	Oct. 3

PRICES CURRENT.—*Continued from page 307.*

STONE (*continued*).

	s.	d.		
Ancaster in blocks	1	10	per ft. cube, deld. rly. depôt	
Beer "	1	6	"	"
Greenshill "	1	10	"	"
Darley Dale in blocks	2	4	"	"
Red Corsehill "	2	2	"	"
Closeburn Red Freestone	2	0	"	"
Red Mansfield "	2	4	"	"

YORK STONE—*Robin Hood Quality.*

Scappled random blocks.	2	10	"	"
6 in. sawn two sides landings to sizes (under 40 ft. super.)	2	3	per ft. super.,	"
6 in. rubbed two sides ditto, ditto	2	6	"	"
3 in. sawn two sides slabs (random sizes)	0	11½	"	"
2 in. to 2½ in. sawn one side slabs (random sizes)	0	7½	"	"
1½ in. to 2 in. ditto, ditto	0	6	"	"

HARD YORK—

Scappled random blocks.	3	0	per ft. cube,	"
6 in. sawn two sides landings to sizes (under 40 ft. super.)	2	8	per ft. super.,	"
6 in. rubbed two sides ditto	3	0	"	"

STONE (*continued*).

HARD YORK (*continued*)—

3 in. sawn two sides slabs (random sizes)	1	2	per ft. sup., deld. rly. depôt.	
2 in. self-faced random flags	0	5	"	"

	s.	d.		
Hopton Wood (Hard Bed) in blocks	2	0	per ft. cube, deld. rly. depôt.	
" " " 6 in. sawn both sides landings	2	7	per ft. super. deld. rly. depôt.	
" " " 3 in. sawn both sides random slabs	1	0	"	"
" " " 2 in. do.	0	8½	"	"

SLATES.

In.	In.	£	s.	d.		
20	10 best blue Bangor	13	2	6	per 1000 of 1200 at r. d.	
20	12 " "	13	17	6	"	"
20	10 first quality "	13	0	0	"	"
20	12 " "	13	15	0	"	"
16	8 " "	7	5	0	"	"
20	10 best blue Portmadoc	12	12	6	"	"
16	8 " "	6	12	6	"	"
20	10 best Eureka unfading green	15	17	6	"	"
20	12 " "	18	7	6	"	"
18	10 " "	13	5	0	"	"
16	8 " "	10	5	0	"	"

SLATES (*continued*).

In.	In.	£	s.	d.		
20	10 permanent green	11	12	6	per 1000 of 1200 at r.d.	
18	10 " "	9	12	6	"	"
16	8 " "	6	12	6	"	"

TILES.

	s.	d.		
Best plain red roofing tiles	42	0	per 1000 at rly. depôt.	
Hip and Valley tiles	3	7	per doz.	"
Best Broseley tiles	50	0	per 1000	"
Do. Ornamental tiles	52	6	"	"
Hip and Valley tiles	4	0	per doz.	"
Best Ruabon red, brown, or brindled do. (Edwards)	57	6	"	"
Do. Ornamental do.	60	0	"	"
Hip tiles	4	0	per doz.	"
Valley tiles	3	0	"	"
Best Red or Mottled Staffordshire do. (Peakes)	51	9	per 1000	"
Do. Ornamental do.	54	6	"	"
Hip tiles	4	1	per doz.	"
Valley tiles	3	8	"	"
Best "Rosemary" brand plain tiles	48	0	per 1000	"
Best Ornamental tiles	50	0	"	"
Hip tiles	4	0	per doz.	"
Valley tiles	3	8	"	"
Best "Hartshill" brand plain tiles, sand-faced	50	0	per 1000	"
Do pressed	47	6	"	"
Do. Ornamental do.	50	0	"	"
Hip tiles	4	0	per doz.	"
Valley tiles	3	6	"	"

WOOD.

BUILDERS' WOOD.	£ s. d.			£ s. d.		
	4½ per standard.					
Deals: best 3 in. by 11 in. and 4 in. by 9 in. and 11 in.	13	10	0	... 15	0	0
Deals: best 3 by 9	13	0	0	... 14	0	0
Battens: best 2½ in. by 7 in. and 8 in., and 3 in. by 7 in. and 8 in.	11	0	0	... 12	0	0
Battens: best 2½ by 6 and 3 by 6...	0	10	0	less than 7 in. and 8 in.		
Deals: seconds	1	0	0	less than best.		
Battens: seconds	0	10	0	,,	,,	
2 in. by 4 in. and 2 in. by 6 in.	9	0	0	... 10	0	0
2 in. by 4½ in. and 2 in. by 5 in.	8	10	0	... 9	10	0
Foreign Sawn Boards—						
1 in. and 1¼ in. by 7 in.	0	10	0	more than battens.		
¾ in.	1	0	0	,,		
	At per load of 50 ft.					
Fir timber: best middling Danzig or Memel (average specification)	4	10	0	... 5	0	0
Seconds	4	0	0	... 4	10	0
Small timber (8 in. to 10 in.)	3	12	6	... 3	15	0
Small timber (6 in. to 8 in.)	3	0	0	... 3	10	0
Swedish balks	2	10	0	... 3	0	0
Pitch-pine timber (30 ft. average)	4	0	0	... 4	15	0
JOINERS' WOOD.	At per standard.					
White Sea: first yellow deals, 3 in. by 11 in.	24	0	0	... 25	0	0
3 in. by 9 in.	22	0	0	,, 23	0	0
Battens, 2½ in. and 3 in. by 7 in.	6	10	0	... 18	0	0
Second yellow deals, 3 in. by 11 in.	18	10	0	... 20	0	0
,, ,, 3 in. by 9 in.	17	10	0	... 19	0	0
Battens, 2½ in. and 3 in. by 7 in.	13	10	0	... 14	10	0
Third yellow deals, 3 in. by 11 in. and 9 in.	13	10	0	... 15	0	0
Battens, 2½ in. and 3 in. by 7 in.	11	0	0	... 12	0	0
Petersburg: first yellow deals, 3 in. by 11 in.	21	0	0	... 22	10	0
Do. 3 in. by 9 in.	18	0	0	... 19	10	0
Battens	13	10	0	... 15	0	0
Second yellow deals, 3 in. by 11 in.	16	0	0	... 17	0	0
Do. 3 in. by 9 in.	14	10	0	... 16	0	0
Battens	11	0	0	... 12	10	0
Third yellow deals, 3 in. by 11 in.	13	0	0	... 14	0	0
Do. 3 in. by 9 in.	12	10	0	... 14	0	0
Battens	10	0	0	... 11	0	0
White Sea and Petersburg—						
First white deals, 3 in. by 11 in.	14	10	0	... 15	10	0
,, ,, 3 in. by 9 in.	13	10	0	... 14	10	0
Battens	11	0	0	... 12	0	0
Second white deals, 3 in. by 11 in.	13	10	0	... 14	10	0
,, ,, 3 in. by 9 in.	12	10	0	... 13	10	0
,, ,, battens	10	0	0	... 11	0	0
Pitch-pine: deals	18	0	0	... 21	0	0
Under 2 in. thick extra	0	10	0	... 1	0	0
Yellow Pine—First, regular sizes	44	0	0	upwards.		
Oddments	32	0	0	,,		
Seconds, regular sizes	33	0	0	,,		
Yellow Pine oddments	28	0	0	,,		
Kauri Pine—Planks, per ft. cube	0	3	6	... 0	5	0
Danzig and Stettin Oak Logs—						
Large, per ft. cube	0	3	0	... 0	3	6
Small ,, ,,	0	2	6	... 0	2	9
Wainscot Oak Logs, per ft. cube	0	5	6	... 0	6	0
Dry Wainscot Oak, per ft. sup. as inch	0	0	8½	... 0	0	9½
¾ in. do. do	0	0	7	...	—	
Dry Mahogany—Honduras, Tabasco, per ft. super. as inch	0	0	9	... 0	1	0
Selected, Figury, per ft. super. as inch	0	1	6	... 0	2	6
Dry Walnut, American, per ft. super. as inch	0	0	10	... 0	1	0
Teak, per load	17	0	0	... 22	0	0
American Whitewood Planks, per ft. cube	0	4	0	... 0	5	0
Prepared Flooring, etc.—	Per square.					
1 in. by 7 in. yellow, planed and shot	0	13	6	... 0	17	6
1 in. by 7 in. yellow, planed and matched	0	14	0	... 0	18	0
1¼ in. by 7 in. yellow, planed and matched	0	16	0	... 1	0	0
1 in. by 7 in. white, planed and shot	0	12	0	... 0	14	6
1 in. by 7 in. white, planed and matched	0	12	6	... 0	15	0
1¼ in. by 7 in. white, planed and matched	0	15	0	... 0	16	6
¾ in. by 7 in. yellow, matched and beaded or V-jointed brds.	0	11	0	... 0	13	6
1 in. by 7 in. ,, ,,	0	14	0	... 0	18	0
¾ in. by 7 in. white ,, ,,	0	10	0	... 0	11	6
1 in. by 7 in. ,, ,, ,,	0	12	9	... 0	15	0
6 in. at 6d. to 9d. per square less than 7 in.						

JOISTS, GIRDERS, &c.

	In London, or delivered Railway Vans, per ton. £ s. d.			£ s. d.		
Rolled Steel Joists, ordinary sections	7	0	0	... 7	10	0
Compound Girders, ordinary sections	9	0	0	... 10	0	0
Steel Compound Stanchions	12	0	0	... 13	0	0
Angles, Tees, and Channels, ordinary sections	9	0	0	... 10	0	0
Flitch Plates	9	0	0	... 10	0	0
Cast Iron Columns and Stanchions including ordinary patterns	7	10	0	... 8	10	0

METALS.

IRON—	Per ton, in London. £ s. d.			£ s. d.		
Common Bars	8	0	0	... 8	10	0
Staffordshire Crown Bars, good merchant quality	8	10	0	... 9	0	0
Staffordshire "Marked Bars"	10	10	0	...	—	
Mild Steel Bars	8	15	0	... 9	0	0
Hoop Iron, basis price	9	5	0	... 9	10	0
,, ,, Galvanised	17	0	0	...	—	
(*And upwards, according to size and gauge.)						
Sheet Iron Black—						
Ordinary sizes to 20 g.	9	10	0	...	—	
,, ,, 24 g.	10	10	0	...	—	
,, ,, 26 g.	12	0	0	...	—	
Sheet Iron, Galvanised, flat, ordinary quality—						
Ordinary sizes, 6 ft. by 2 ft. to 3 ft. to 20 g.	14	0	0	...	—	
Ordinary sizes to 22 g. and 24 g.	14	10	0	...	—	
,, ,, 26 g.	15	0	0	...	—	
Sheet Iron, Galvanised, flat, best quality—						
Ordinary sizes to 20 g.	17	0	0	...	—	
,, ,, 22 g. and 24 g.	17	10	0	...	—	
,, ,, 26 g.	19	0	0	...	—	

METALS (*continued*).

	Per ton, in London. £ s. d.			£ s. d.		
Galvanised Corrugated Sheets—						
Ordinary sizes 6 ft. to 8 ft. 20 g.	14	0	0	...	—	
,, 22 g. and 24 g.	14	10	0	...	—	
,, 26 g.	15	15	0	...	—	
Best Soft Steel Sheets, 6 ft. by 2 ft. to 8 ft. by 20 g. and thicker	11	10	0	...	—	
Best Soft Steel Sheets, 22 g. & 24 g.	12	10	0	...	—	
,, ,, 26 g.	14	15	0	...	—	
Cut Nails, 3 in. to 6 in. (Under 3 in., usual trade extras.)	9	10	0	... 9	15	0

LEAD, &c.

	Per ton, in London. £ s. d.			£ s. d.		
LEAD—Sheet, English, 3lb. and up,	20	2	6	...	—	
Pipe in coils	20	12	6	...	—	
Soil pipe	23	2	6	...	—	
Compo pipe	23	2	6	...	—	
ZINC—Sheet—						
Vieille Montagne ...ton	33	0	0	...	—	
Silesian	32	15	0	...	—	
COPPER—						
Strong Sheet ...per lb.	0	1	1	...	—	
Thin ,, ... ,,	0	1	2	...	—	
Copper nails ... ,,	0	1	0	...	—	
BRASS—						
Strong Sheet ... ,,	0	1	0	...	—	
Thin ,, ... ,,	0	1	1	...	—	
TIN—English Ingots ... ,,	0	1	9	...	—	
SOLDER—Plumbers' ... ,,	0	0	8½	...	—	
Tinmen's ... ,,	0	0	10½	...	—	
Blowpipe ... ,,	0	0	11½	...	—	

ENGLISH SHEET GLASS IN CRATES OF STOCK SIZES.

15 oz. thirds	2½d. per ft. delivered.
,, fourths	1¾d. ,, ,,
21 oz. thirds	3¼d. ,, ,,
,, fourths	2¼d. ,, ,,
26 oz. thirds	4¼d. ,, ,,
,, fourths	3¼d. ,, ,,
32 oz. thirds	5d. ,, ,,
,, fourths	4¼d. ,, ,,
Fluted Sheet, 15 oz.	3¼d. ,, ,,
,, 21 oz.	4¼d. ,, ,,

ENGLISH ROLLED PLATE IN CRATES OF STOCK SIZES.

¼ Hartley's	2½d. per ft. delivered.
¼ ,,	2¼d. ,, ,,
¼ ,,	3d. ,, ,,
Figured and Oxford Rolled "Oceanic" Glass, white ...	4d. ,, ,,
Do. ,, tinted ...	5¼d. ,, ,,

OILS, &c.

		£ s. d.
Raw Linseed Oil in pipes	per gallon	0 1 10
,, ,, ,, in barrels	,,	0 1 11
,, ,, ,, in drums	,,	0 2 1
Boiled ,, ,, in pipes	,,	0 2 0
,, ,, ,, in barrels	,,	0 2 1
,, ,, ,, in drums	,,	0 2 3
Turpentine in barrels	,,	0 3 8
,, in drums	,,	0 3 10
Genuine Ground English White Lead	per ton	23 0 0
Red Lead, Dry	,,	22 0 0
Best Linseed Oil Putty	per cwt.	0 7 0
Stockholm Tar	per barrel	1 12 0

VARNISHES, &c.

	Per gallon. £ s. d.
Fine Pale Oak Varnish	0 8 0
Pale Copal Oak	0 10 6
Superfine Pale Elastic Oak	0 12 6
Fine Extra Hard Church Oak	0 10 0
Superfine Hard-drying Oak, for seats of Churches	0 14 0
Fine Elastic Carriage	0 12 6
Superfine Pale Elastic Carriage	0 16 0
Fine Pale Maple	0 16 0
Finest Pale Durable Copal	0 18 0
Extra Pale French Oil	1 1 0
Eggshell Flatting Varnish	0 18 0
White Copal Enamel	1 4 0
Extra Pale Paper	0 12 0
Best Japan Gold Size	0 10 6
Best Black Japan	0 16 0
Oak and Mahogany Stain	0 9 0
Brunswick Black	0 8 6
Berlin Black	0 16 0
Knotting	0 10 0
French and Brush Polish	0 10 0

TERMS OF SUBSCRIPTION.

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TENDERS.

Communications for insertion under this heading should be addressed to "The Editor," and must reach us *not later than* 10 *a.m. on Thursdays*. [N.B.—We cannot publish Tenders unless authenticated either by the architect or the building-owner; and we cannot publish announcements of Tenders accepted unless the amount of the Tender is stated, nor any list in which the lowest Tender is under 100*l.*, unless in some exceptional cases and for special reasons.]

* Denotes *accepted*. † Denotes *provisionally accepted*.

BARROW-IN-FURNESS.—For constructing streets, for the Corporation. Mr. J. Walker Smith, Borough Engineer and Surveyor:—

	Fife-street.	Brighton-street.
W. H. Worthington	£497 0 0	.... £53 12 0
W. Gradwell & Co., Ltd.	493 16 8	.... 36 2 3
J. Cleator	377 1 6	.... 31 14 2
Rainey Bros., Barrow*	369 19 0	.... 28 17 6

BARROW-IN-FURNESS.—For the construction of surface water sewers, for the Corporation:—

W. Underwood & Bros.	£16,350 9 10
W. Gradwell & Co., Ltd.	15,597 0 6
J. Tottie	15,431 12 0
J. S. Dawson	15,019 15 1
Clark & Robinson	14,930 0 0
Rainey Bros.	14,926 0 0
Smedley & Booth	14,800 0 0
Johnson & Langley	14,165 1 8
Q. Bell & Sons, Ltd.	13,983 4 11
G. Mackay & Son	13,736 16 6
J. Bentley	1,3469 17 0
J. Laing & Son, Carlisle*	11,660 0 0

BARRY.—For the erection of public offices in Holton-road, for the Barry Urban District Council. Messrs. C. E. Hutchinson & E. Harding Payne, A.A.R.I.B.A., 29, John-street, Bedford-row, W.C., architects:—

A. Richards	£8,610	E. R. Evans & Sons	£7,770
Jones Bros.	8,600	D. Davies & Sons	7,750
Lloyd & Tape	8,547 15 10	J. Allen & Sons	7,701 10
W. Britton	8,275	D. W. Davies	7,488
H. S. Rendell	8,050		

BECCLES.—For new hotel, with stabling, coach-house, and cart shed, Ingate-road, Beccles. Mr. Arthur Pells, F.S.I., architect, Beccles:—

Ebbs & Barton	£2,694	Gill	£2,195
Jones & Sons	2,638	J. Youngs & Son	2,185
T. H. Yelf	2,385	A. D. Boddy & Son	2,165
Dowsing & Son	2,307	F. R. Hipperson	2,137
Hipperson Bros.	2,270	T. Parkington & Son	2,100
Grimwood & Sons	2,253	G. E. Hawes, Norwich*	1,890
King	2,215	Hindes & Co.	1,881
R. F. Brett	2,205		

COLEFORD (Glos.).—Accepted for the erection of a doctor's residence. Mr. E. G. Davies, architect, Hereford and Monmouth:—

Forest of Dean Stone Firms, Ltd., Coleford £1,010

HOLYWELL GREEN.—For paving works for Stainland-with-Old-Lindley Urban District Council. Mr. J. H. Walker, Surveyor, Mechanics' Hall, Stainland:—

H. & N. Barraclough, A. Burton*, Tebbs & Mottashaw } On a Schedule of Prices.

KNOTTY ASH.—For the erection of laundry buildings at Highfield Infirmary, for Liverpool Select Vestry. Mr. Edmund Kirby and Mr. W. E. Willink, architects 5, Cook-street, Liverpool:—

Ballen, Bros., & Sons, Ltd., 39, Almond-street, Liverpool ... £5,908

LONDON.—For 170 yds. of 3-in. to 5-in. steam pipe, etc., at Workhouse, Renfrew-road, Lower Kennington-lane, S.E., for Lambeth Guardians. Mr. G. E. Arnold, Consulting Engineer, 195, Kennington-road, S.E.:—

Z. D. Berry & Sons, Albion Works, Regency-street, Westminster ... £225

LUTON.—For paving, etc., in Ash-road and William-street, for the Town Council. Mr. S. F. L. Fox, Borough Surveyor, Town Hall, Luton:—

Ash-road.

Free & Sons	£412 0 0	W. H. Worthington	£360 5 0
M. Thacker & Co.	382 4 0	Jacobs & Burton	353 18 4
Patent Victoria Stone Co.	373 1 8	W. H. Wheeler	337 0 8
		G. Powdrill, Luton*	335 0 0

William-street.

Thacker & Co.	£274 2 3	W. H. Wheeler	216 9 0
W. H. Worthington	262 18 6	Patent Victoria Stone Co.	209 6 0
Jacobs & Burton	235 4 3	G. Powdrill*	190 0 0
Free & Son	232 7 0		

NAIRN.—For additions and alterations to Larkfield. Mr. W. Mackintosh, architect, Inverness:—

Mason: D. Rose, Forres
Carpenters: A. Mc Lean & Son, Nairn
Slaters: Reid & Chapman, Nairn
Plumber: F. H. Wink, Nairn
Plasterers: Fowler & Kennedy, Inverness
Painters: W. Mackintyre & Son, Nairn
} Total amount of tenders accepted £1,209 10 8

ROSS (Herefordshire).—For erecting a detached house at Bridstow, near Ross, for Mr. J. Martin Newton. Messrs. Groome & Bettington, architects and surveyors, Palace-chambers, Hereford. Quantities by architects:—

—	Amount of Tender.	Additional for Oak, etc.	Total Amount of Tender.
	£ s. d.	£ s. d.	£ s. d.
W. Rowbery	1,433 7 0	55 18 8	1,489 5 8
W. Jones	1,400 0 0	55 0 0	1,455 0 0
J. T. Jones	1,370 0 0	82 1 0	1,452 1 0
J. B. Kemp & Sons	1,355 0 0	52 4 0	1,407 4 0
W. Lewis	1,320 0 0	47 16 6	1,367 16 0
W. James	1,339 0 0	25 0 0	1,364 0 0
W. Powell	1,260 0 0	46 10 1	1,306 10 1
W. Bolt	1,230 0 0	70 15 0	1,300 15 0
C. Cooke	1,209 0 0	54 8 4	1,263 8 4
E. W. Wilks, Hereford*	1,135 0 0	42 2 0	1,177 2 0

REDBOURN (Herts).—For the erection of a seven-roomed cottage at Church End, for Mr. G. A. Dunn. Mr. E. A. Fermaud, architect, 11, Chichester-street, London, S.W. Quantities by the architect:—

W. J. Nigus	£392 0	W. Payne	£352 0
Edwards & Medway	390 0	H. Salisbury & Son	340 0
G. Neal	367 0	E. Peck, Redbourn*	339 9

ROMFORD.—For extension of isolation hospital for the Joint Hospital Board. Mr. F. Whitmore, Architect, 73, Duke-street, Chelmsford:—

—	A New Ward, Pavilion.	B Nurses' Quarters.	C Conval. Block.	D Fencing, Drains.	Total.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
A. Gray	2,409 10 0	799 17 3	641 2 0	240 0 0	4,091 9 3
C. Wall Ltd.	2,350 0 0	710 0 0	600 0 0	300 0 0	3,960 0 0
Dowsing & Davis	2 264 0 0	726 0 0	620 0 0	340 0 0	3,950 0 0
Mason & Son	2 247 10 0	760 0 0	628 10 0	253 0 0	3,889 0 0
T. J. Bailey	2,235 7 8	770 8 3	609 17 0	272 7 1	3,888 0 0
F. Bennett	2,228 0 0	759 0 0	638 0 0	257 0 0	3,882 0 0
Allen Bros.	2,200 8 0	762 0 6	625 14 7	282 13 8	3,870 16 9
J. Young & Son	2,225 0 0	725 0 0	625 0 0	265 0 0	3,840 0 0
S. E. Moss	2,225 0 0	675 0 0	625 0 0	240 0 0	3,765 0 0
Coulson & Lofts	2,140 0 0	808 0 0	580 0 0	232 0 0	3,760 0 0
W. J. Maddison	2,098 0 0	707 0 0	595 0 0	329 0 0	3,729 0 0
H. Potter & Son	2,160 0 0	602 0 0	600 0 0	267 0 0	3,719 0 0
J. Smith & Son	2,186 0 0	715 0 0	629 0 0	185 0 0	3,715 0 0
Stedman & Co.	2,065 0 0	715 0 0	595 0 0	298 0 0	3,673 0 0
J. McKay	2,145 0 0	690 0 0	590 0 0	223 0 0	3,648 0 0
W. Lawrence & Son	2,100 0 0	710 0 0	590 0 0	238 0 0	3,638 0 0
J. S. Hammond & Son	2,048 0 0	693 0 0	602 0 0	165 0 0	3,508 0 0
R. Elvy & Son	2,053 0 0	693 0 0	568 0 0	236 0 0	3,550 0 0
Kerridge & Shaw	2,024 0 0	683 0 0	568 0 0	243 0 0	3,518 0 0
F. Davey	1,997 0 0	693 0 0	587 0 0	197 0 0	3,474 0 0
F. & E. Davey Ltd.	2,601 2 5	666 13 11	590 9 2	205 14 6	3,464 0 0
T. Parkington & Son	2,000 0 0	685 0 0	565 0 0	200 0 0	3,450 0 0
Fitch & Cox	1,995 3 10	685 10 5	572 8 4	183 6 5	3,436 9 0
W. Dennison	1,770 0 0	657 0 0	541 0 0	253 0 0	3,241 0 0
F. & A. Willmott, Ilford*	1,889 0 0	629 0 0	525 0 0	175 0 0	3,218 0 0

REDBOURN (Herts.).—For the erection of three detached cottages at Church End, for Mr. G. A. Dunn. Mr. E. A. Fermaud, architect, 11, Chichester-street, London, S.W. Quantities by the architect.

E. Horn & Sons	£897	H. Salisbury & Son	£859
F. Newton	882	W. Payne, Watford*	783
G. Neal	875	G. W. Souster	738

RHOS.—For sewer extension, Osborne-street, for the Wrexham Rural District Council. Mr. J. Price Evans, C.E., Argyle-chambers, Wrexham:—

Holmes & King, Ltd.	£196 2 6	T. H. Simmons	£136 16 7
J. Stephens	156 3 9	I. Jenkins	115 3 10
R. Williams	145 13 0	Stephens & Davies	110 10 0
Davies Bros.	144 4 8	W. Jones	99 17 6
E. Phillips & Son	135 13 3	T. Ll. Davies, Rhos*	93 8 3
H. A. Jones	132 3 0		

ROTHWELL HAIGH.—For the erection of engine-house and pump-room at Workhouse, for Hunslet Guardians. Mr. W. E. Richardson, architect, Rothwell, near Leeds:—

W. Airey & Son	£220 0	J. Chapman & Son, Rothwell, Leeds*	£191 5
Binks Bros.	213 18		
F. O. Farrell	195 0		

STANLEY.—For Stanley and West Hallam Waterworks. Messrs. Elliott & Brown, engineers and surveyors, Burton-buildings, Parliament-street, Nottingham:—

General Contract.

Ratcliffe, Franklin, & Procter	£5,244 16	H. E. Buckley	£2,531 0
A. & E. Oakes	3,388 8	F. Evans	2,475 0
W. L. Meredith	3,062 5	T. Egan & Sons	2,449 13
J. Totty	2,944 6	F. Mitchell & Son	2,429 0
R. Tabor	2,776 19	Lane Bros.	2,425 18
C. Williamson	2,695 0	H. Shardlow	2,393 13
W. H. Hill	2,649 0	J. S. Dawson	2,369 5
W. Craig	2,643 0	H. Siddons	2,300 19
C. E. Cox & Co.	2,636 14	J. H. Harper	2,210 0
Lock, Andrews, & Price	2,600 0	G. F. Tomlinson, City-road, Derby*	2,185 0
Bower Bros.	2,562 0	G. H. Robinson	2,105 0
F. J. Collingwood & Co.	2,538 0		

For Cast Iron Pipes.

Jarrow & Co., Ltd.	£1,989 1 0	Sheepbridge Coal & Iron Co., Ltd.	£1,597 19 10
Cochrane & Co.	1,662 1 9	Stanton Iron Works Co., Ltd.	1,591 2 0

RUABON.—For construction of storage tank in cement concrete, and enlargement of ejector, for the Rural District Council. Mr. J. Price Evans, C.E., Argyle-chambers, Wrexham:—

S. Moss	£1,696 4 9	T. H. Simmons	£1,410 16 11
Holmes & King, Ltd.	1,663 16 9	T. Ll. Davies	1,372 17 7
Davies Bros.	1,527 17 0	J. T. Jones	1,343 12 2
T. Jones & Son	1,526 0 0	R. Williams	1,313 10 4
		I. Jenkins, Johnstown*	1,270 12 3

SEDGEFIELD.—For sewerage and sewage disposal works, Ferryhill Village (Southside), for the Rural District Council. Mr. J. Stones, Engineer and Surveyor, Sedgefield:—

J. Carrick, Durham*	£922 19 10

SWANSEA.—For a new power-house at Swansea, for the English Crown Spelter Co. Mr. J. M. V. Money-Kent C.E., engineer, 25, Old Queen-street, Westminster, S.W.:—

W. H. Michael & Co.	£1,581	J. & D. Jones	£1,400
Bennett Bros.	1,538	J. Williams	1,300
Lloyd Bros.	1,519	Walters & Johns*	1,260

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